UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PORTLAND GENERAL ELECTRIC COMPANY	)	Docket Nos. 50-514
(Pebble Springs Nuclear Plant	)	50-515
Units 1 and 2)	)	

APPLICANT'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW IN THE FORM OF A PARTIAL INITIAL DECISION AS TO SOME ENVIRONMENTAL AND SITE SUITABILITY MATTERS

I. INTRODUCTION AND BACKGROUND

On December 9, 1974, the U. S. Atomic Energy Commission published a "Notice of Hearing on application for construction permits" (39 FR 42938) with respect to the application filed by Portland General Electric Company ("PGE") for construction permits to build two pressurized water nuclear reactors designated as the Pebble Springs Nuclear Plant, Units 1 and 2 (the "facilities") to be located near Arlington in Gilliam County, Oregon. The notice set forth the requirements pursuant to the Atomic Energy Act of 1954, as amended, and the National Environmental Policy Act of 1969 to be met prior to the issuance of construction permits. The notice also provided that any person whose interest might be affected by the proceeding could file a petition for leave to intervene, in accordance with requirements of 10 CFR Section 2.714 not later than January 8, 1975, and also further notified interested persons to file requests for limited appearances pursuant to the provisions of 10 CFR Section 2.715. In addition, the notice designated this Atomic Safety and Licensing Board ("the Board") to conduct the hearing in this proceeding.

Though the notice set forth all the issues which must be considered and decided by this Board to determine whether construction permits

should be issued, this Partial Initial Decision addresses only the environmental issues specified in 10 CFR Part 51 and the site suitability issues specified in 10 CFR 50.10 (e) (2). A decision on other matters will be issued after further public hearings.

Pursuant to the notice, the State of Oregon, by and through its Nuclear and Thermal Energy Council, on December 16, 1974, petitioned to participate in this proceeding as an interested State pursuant to 10 CFR Section 2.715 (c). The Nuclear Regulatory Commission Staff ("the Staff") supported the State of Oregon's petition and there being no objection, the Board admitted the State of Oregon as an interested State for purposes of these proceedings.

Pursuant to the notice, a petition for leave to intervene was filed on January 8, 1975 by Lloyd K. Marbet on his behalf and on behalf of Forelaws on Board and Coalition for Safe Power. A further petition for leave to intervene was filed on January 13, 1975 by R. J. Epping.

On April 24, 1975, after the filing of such briefs and affidavits, the Board granted the Petitions to intervene of the Coalition for Safe Power and Forelaws on Board, admitted two of their proposed contentions as matters in controversy and authorized Mr. Marbet, as an officer or member of both organizations, to represent them in this proceeding. The Board denied Mr. Marbet's Petition to Intervene in an individual capacity for want of a sufficient showing of personal interest in the proceeding. The petition of R. J. Epping was also denied.

On May 5, 1975, PGE and Mr. Marbet, pursuant to 10 CFR Section 2.714a, appealed this Board's grant of intervention to the Atomic Safety and Licensing Appeal Board. At the same time, Mr. Marbet moved to disqualify Dr. Walter H. Jordan as a member of this Board which motion was referred by this Board to the Atomic Safety and Licensing Appeal Board on May 16, 1975. On May 28, 1975 the Atomic Safety and Licensing Appeal Board, after considering the briefs of the parties, issued ALAB-273 denying Applicant's appeal, denying the motion to disqualify Dr. Jordan and

granting Mr. Marbet's appeal to be allowed to personally participate in the proceedings.

On January 23, 1976, Pacific Power & Light Company and Puget Sound Power & Light Company entered into an ownership agreement with PGE (hereinafter these three Companies are collectively referred to as the "Applicant")[1]. An amended notice of hearing was published in the Federal Register on February 23, 1976 (41 FR 8002). The amended notice afforded any person whose interest may be affected by the entrance of Puget Sound Power & Light Company and Pacific Power & Light Company as joint-applicants for the opportunity to participate in this proceeding. As a result of the amended notice of hearing, additional petitions to intervene were received. The Board subsequently approved the petitions of Project Survival, Phillip Levy, Dennison Levy, Charles Thomas, Sara Thomas, Al Bannon and Katherine Bannon. In order to facilitate the conduct of the hearing and inasmuch as their interests and contentions were similar, the Board ruled that the approved Petitioners be consolidated as one party.

Various evidentiary hearings in this matter have been held and are ongoing to the present date. On October 1, 1980, the Board directed the parties to file proposed findings of fact and conclusions of law on site suitability and environmental issues for which the record is closed. Pursuant to the Board's order, the parties filed proposed findings. In making the following findings and conclusions, we reviewed and considered the entire record in this case and all of the parties' proposed findings of fact and conclusions of law. Those proposed findings of fact and conclusions of law submitted by the parties which are not incorporated directly or inferentially in this Partial Initial Decision are rejected as being unsupported in law or fact or as being unnecessary to the rendering of this decision.

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[1] Pursuant to this agreement, PGE will own 40 percent of the facility, and remain the principal owner with responsibility for licensing, constructing and operating the facility. Pacific will have a 25-percent interest and Puget will have a 20-percent interest, with the remaining 15 percent unallocated portion designated for "others".

II. FINDINGS OF FACT - ENVIRONMENTAL MATTERS

A. NATIONAL ENVIRONMENTAL POLICY ACT REQUIREMENTS AND THE ENVIRONMENTAL IMPACT STATEMENTS

1. As required by 10 CFR Part 50, Appendix D[2], the Applicant submitted with its application an Environmental Report (ER) in May 1974 to which it subsequently added Amendments 1 through 3. The ER, as amended, was received into evidence as Applicant's Exhibit A-2 (Tr. 287). Pursuant to the requirements of the National Environmental Policy Act of 1969 (83 Stat. 852) as implemented by E.O. 11514 and the CEQ guidelines of August 1, 1973 (38 FR 20550) and based on the environmental information submitted by the Applicant in the ER, and on its independent analysis and review, the Staff prepared a Draft Environmental Statement (DES) which was issued in January 1975. By a notice of availability published January 6, 1975, the public was invited to comment on the DES (39 FR 42938). Copies of the DES were also provided to appropriate Federal, State and local agencies for their comment. In April 1975, the Staff published its Final Environmental Statement (FES) (40 FR 823) which includes, among other things, the full text of all comments received with respect to the DES as well as the Staff's responses to those comments, with the exception of certain late filed comments and the Staff's response thereto which were separately made a part of this record. The FES was received into evidence as Staff Exhibit S-1 (Tr. 265).

2. Certain testimony filed by the Staff at the evidentiary hearing amended the FES in some respects. The FES, as amended by the record of this proceeding, fully describes the Plant site, the major systems of the Plant, the environmental effects of site preparation and Plant and transmission line construction, the environmental effects of both Plant operation and postulated design basis accidents, and the Applicant's environmental monitoring program.

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[2] Appendix D to 10 CFR Part 50 has since been superseded by 10 CFR Part 51 (see 39 FR 26279, dated July 18, 1974).

B. COMPLIANCE WITH FEDERAL WATER POLLUTION CONTROL ACT

3. The Commission may not issue any license or permit for the facility unless, in compliance with Section 401 of the Federal Water Pollution Control Act amendments of 1972 (FWPCA), the State of Oregon either certifies (a) that there are no applicable effluent limitations or standards under Sections 301, 302, 306 and 307 of the FWPCA, or (b) there are such applicable standards and limitations and the discharges from the Pebble Springs Nuclear Plant, Units 1 and 2, will comply with those standards and limitations; or in the alternative has waived certification.

4. On December 1, 1975, the Applicant received from the Department of Environmental Quality of the State of Oregon a Waste Discharge Permit and a letter of the same date certifying that the proposed facility "will comply with applicable provisions of Sections 301, 302, 306 and 307 of the Federal Act - i.e., there is reasonable assurance that it will not violate applicable water quality standards." (Ex. A-6, Tr. 892). The Board finds that the Certificate and Permit satisfy the requirements of Section 401 of FWPCA.

C. IMPACTS OF CONSTRUCTION

Land Use

5. Agriculture is the primary use of the gently sloping to undulating land within 50 miles of the site. The site is in a semi-arid environment dominated by low growth, shrub-steppe vegetation. No timbered areas are present on the site. Dryland range and dryland cereal grain crops are the most important land uses in the immediate vicinity. Several small irrigated plots of alfalfa, other hay products and field crops are located within several miles of the site. (Ex. S-1, p. 4-1).

6. Approximately 2045 acres of the Pebble Springs site will be disturbed by construction activities. Most of the remaining 6350 acres within the site boundary will remain in the natural state. Construction

and excavation activities will be at least 3 miles from the Columbia River and 1.5 miles from the nearest residence (Ex. S-1, p. 4-1).

7. The use of heavy machinery to excavate, grade and create spoil areas produces an obvious opportunity for erosion by both wind and water. Owing to the permeable nature of the surface soils and sparse rainfall, natural surface runoff is minimal, but the potential for wind erosion and blowing dust is considerable. The Applicant has indicated an intent (Ex. A-2, p. 4.1-2) to provide erosion protection and reduce blowing dust by removing the existing vegetative cover only from those areas required to accomplish specific tasks. These areas will include the Plant access road, railroad rights-of-way and construction areas in the immediate site vicinity. To reduce blowing dust, gravel will be applied and water sprinkled on construction roads and other hard-use surfaces (Ex. S-1, p. 4-1; Ex. A-2, p. 4.1-2).

8. The Applicant has stated that immediately following construction these disturbed areas will be revegetated according to the recommendations of the U. S. Soil Conservation Service. The Applicant has stated that borrow areas for the earthfill dam construction will be restored and revegetated (Ex. A-2, pp. 4.1-2 and 4.1-3).

9. Construction noise, smoke and the effect of explosives will be limited to areas that are uninhabited. In response to a Board question (Tr. 90), the Applicant stated that trash and debris, including oil and chemical wastes, will be collected and disposed of offsite. The disposal will be by a contractor licensed by the State of Oregon (Christensen following Tr. 292). Truck and other construction vehicle traffic will be largely limited to the site area (Ex. S-1, p. 4-2). The Board concludes that the local populace should experience little adverse effects from the above onsite construction activities.

10. No natural, scenic, historic or recreational areas in Gilliam County are on the site. The nearest such area, the route of the "Old

Oregon Trail", passes 1 mile south of the site. Construction activities should have no effect on historical sites (Ex. S-1, p. 4-2). The Board concludes that the proposed undertaking will not interfere with the preservation of historical, architectural or archaeological objects.

11. The transmission system includes approximately 6.5 circuit miles of line. The two single-circuit 500-kV transmission lines, about 1 mile long, will be constructed on a 500-ft. wide right-of-way involving about 60 acres. The single-circuit 230-kV line to the pumping plant, approximately 4.5 miles long, will be constructed on a 125-ft. wide right-of-way and will occupy about 68 acres (Ex. S-1, p. 4-2).

12. In examining the plans for the proposed transmission lines, the Staff concluded that the construction phase will have only a small impact on the future land use. Transmission line rights-of-way, for the most part, traverse sparsely populated areas with little potential for urban or recreational development. There are no permanent residences along the route of the transmission lines. There will be no significant loss of agricultural productivity since the area is used only for grazing of cattle and sheep, and after construction this use can be resumed. The route of the transmission system does not include any stream crossing; therefore, construction and maintenance activities should not cause siltation of any streams nor alter existing drainage patterns. There is no involvement with national forests, timbered areas, wilderness areas, wildlife refuges or shelter belts. There are no National or State monuments or historic areas encroached by the rights-of-way (Ex. S-1, pp. 4-2 and 4-3). The Applicant has assumed responsibility to reseed areas disturbed by construction (Ex. A-2, p. 4.2-1). We find that the impact of transmission line construction will be minimal and acceptable.

13. The impacts associated with the construction of the buried pipeline will be similar to those for the transmission lines. These impacts will involve primarily soil disturbance and destruction of vegetative cover due to earth-moving and trenching operations, blasting and vehicular access to the corridor. The pipeline corridor will not

involve any residences, stream crossings or significant loss of agricultural productivity. Where the pipeline passes under the Union Pacific Railroad and Highway I-80N, it will run inside steel casings jacked or bored under the railroad and highway and thus will not disrupt traffic on either of these routes (Ex. S-1, p. 4-3).

Water Use

14. The Applicant plans to develop two deep wells to provide water during construction. The two wells will be located 2,000 and 3,000 ft. N. E. of the plant location and will tap the deep basalt aquifer. The wells (one a backup) will be designed to produce a minimum of 500 gpm. The 500 gpm of withdrawal is unlikely to produce adverse impacts on water use, particularly since the pumping will be intermittent, vary with construction requirements and cease at the end of the construction period. The Staff will require the Applicant to obtain all necessary and related State permits before drilling and operating the proposed wells. In addition, to protect the regional groundwater resources, holding tanks for pumped water will be required so as to obviate the need for continuous pumping. Further, the Applicant will be required to stipulate a reasonable length of time after which the wells will be capped and sealed (Ex. S-1, p. 11-6). Thus, the Board finds that construction will not produce adverse impacts on groundwater use.

15. There will be roughly two stages of construction, the phase during intake structure and pipeline construction and the period after pipeline operation which will include reservoir filling. During the first phase, water requirements met by pumpage from the Columbia will be immeasurable in relation to average river discharge. During the second stage, water use will increase to nearly the full capacity of the intake and pipeline design. This will be considered consumptive use of Columbia River water since none will be returned. However, operating at full capacity, the intake system will pump 44,000 gpm through the pipeline to the reservoir. This flow, equivalent to 98 cfs, is only 0.2 percent of the 7-day, 10-yr. low flow of the Columbia River, which is 47,000 cfs (Ex. S-1, p. 4-4). Thus, the Board concludes that the withdrawal will have no impact on other uses of the Columbia River.

Ecological Systems

16. The construction of the Pebble Springs Nuclear Plant will result in the loss or alteration of about 2045 acres of the terrestrial ecosystems of Gilliam County. The ecological impacts associated with the construction of the site of the transmission lines and the makeup water pipeline will be similar, due primarily to clearing of vegetation, earth-moving activities and blasting. Such impacts are common to most large construction projects (Ex. S-1, p. 4-4).

17. Some shrub-steppe vegetation and associated fauna will be destroyed on the Plant site, the transmission line corridors and the pipeline corridor. Some fauna will probably be displaced as a result of such construction activity. The biotic potential of the majority of the species to be affected is such that the loss of individuals has little long-term effect on population structure and stability. Inspection of the site and corridors by the Staff and surveys by the Applicant and its representatives have not identified any ecosystems unique to the area (Ex. S-1, pp. 4-4 and 4-5).

18. Construction of the intake structure on the Columbia River, about 2.5 miles upstream of Arlington, will involve the placing of cofferdams in the river, dewatering of the area within the cofferdams, dredging, erection of the concrete intake substructure and removal of the cofferdams. This phase of construction is expected to be accomplished within one construction season (about 10 months) and will result in the disturbance of about 200 ft. of the river bank and increased turbidity in the vicinity of construction. Several hundred square feet of river bottom will be disturbed due to the dredging and dewatering. This will cause the loss the benthic organisms from this area during the construction period. The increased turbidity will reduce phytoplankton productivity during this period, but such reduction is not expected to have adverse effects on the phytoplankton communities of the John Day reservoir due to the relatively small area involved and the temporary nature of the disturbance (Ex. S-1, p. 4-5; Ex. A-2, pp. 4.1-7 and 4.1-8).

19. Because of the large expanse of undisturbed water in the river adjacent to the expected turbid areas, it is not expected that adult fish will be affected by the turbidity at the construction site. Juvenile fish may not be as sensitive to turbidity gradients as adults and because of the apparent preference of some of the juvenile seaward migrants for the shallower shore waters of the river, individual juveniles may be adversely affected by increased turbidity during the construction period. Enclosure of the construction area by cofferdams, as planned by the Applicant, may help divert fish from the highly turbid area until construction is completed (Ex. S-1, p. 4-5).

20. The construction of a barge slip at Arlington will require a relatively small amount of dredging and excavation of the existing harbor. The excavated material will be stockpiled above expected water levels. Loss of benthic organisms from the channel due to the dredging is expected to be permanent because of the subsequent barge traffic which will frequently disturb the bottom sediments and prevent the establishment of a stable benthic community (Ex. S-1, p. 4-5; Ex. A-2, p. 4.1-7).

Radiological Effects on Construction Workers

21. During the period between the startup of Unit No. 1 and the completion of Unit No. 2, the construction personnel working on Unit 2 may be exposed to additional radiation exposure from the operation of Unit 1. Assuming that a 2-year time period between the startup of Units 1 and 2, the total dose (integrated over the construction period) to construction workers is estimated to be 20 man-rem which compares favorably to estimated values of 10 to 30 man-rem for other LWRs (Ex. S-1, p. 4-4). These doses are a small fraction of the approximately 290 man-rem that construction workers would receive over the same period from natural background radiation (Ex. S-1, p. 4-4). The Board concludes that this additional radiation exposure is small compared to background radiation exposure and therefore is acceptable.

Socioeconomic Effects

22. The potential for social and economic impacts resulting from the construction of a facility of this magnitude is significant. The project will cause increased demands on the local supply of consumer products and housing, as well as private and public services. Those ramifications of greatest importance to the surrounding communities have been evaluated by both the Applicant and the Staff (Heider following Tr. 297; Exs. A-2, A-3 and S-1).

23. The Applicant recognized early in its planning that the construction of a nuclear generating station near Arlington, Oregon, would create significant social and economic impact on surrounding communities. To evaluate these impacts, the Applicant commissioned Bechtel Power Corporation in early 1974 to conduct a preliminary community housing study to aid in determining housing needs for construction workers in the area. The study was completed May 1974 and made available to appropriate local communities as well as applicable State agencies and the NRC. Subsequently, PGE commissioned the architectural-engineering firm of Skidmore, Owings and Merrill (SOM) to make a more comprehensive study of the probable needs of surrounding localities and entities (Heider following Tr. 297). This study was received into evidence as Applicant's Exhibit A-3.

24. The SOM study indicates that there are essentially three categories of entities that must be called upon to meet the social and economic needs of the impacted communities in the area, viz, local governments, private developers and PGE. PGE is to (a) provide planning and, where necessary, financial assistance to communities and private developers; (b) assist coordination among local communities; (c) aid in coordinating private developers efforts and construction workers needs; and (d) provide bachelor housing, if appropriate. The Applicant has tentatively planned a four-phase program to accomplish these ends (Ex. A-2, pp. 8.2-7 and 8.2-8; Heider following Tr. 297; Tr. 395-403).

25. In order to assist local communities meet the requirements that may be imposed upon them by PGE construction, the Applicant established a Public Affairs Office in Arlington and staffed it with a former Arlington City Councilman who had, in that capacity, helped plan the relocation of the City of Arlington when the construction of The Dalles dam flooded the former townsite. He has been working with local governments on community impact problems on a continuing basis (Heider following Tr. 297).

26. The Staff has reviewed the Bechtel study relating to the impact of the Pebble Springs plant on housing and the impact projections on population, housing and public facilities as discussed in the ER and concurs with the Applicant's analyses (Ex. S-1, pp. 4-5 to 4-7). The Staff also considers the SOM study adequate follow-up and the Applicant's plans to mitigate construction impacts to be satisfactory (Grotenhuis following Tr. 609; Tr. 634-35).

27. We find the analyses of socioeconomic impacts to be adequate and that the measures proposed to mitigate them appropriate.

D. IMPACTS OF OPERATION

Land Use

28. The Board considered the effects of the loss of agricultural land from its present use for at least 40 yr. due to construction and operation of the Pebble Springs Nuclear Plant and reservoir (Tr. 89). The Staff compared the loss of agricultural land from its present use against the agricultural benefits that could result from the availability of reservoir water for irrigation (Hinchman following Tr. 599). The Applicant presented testimony in this regard (Kathren following Tr. 300), as did the State of Oregon (Pollock, Tr. 521-24).

29. Gilliam County, Oregon, encompasses an area of 773,120 acres. Prior to disturbance by agriculture, the natural vegetation of the entire county was steppe, various shrub-bunchgrass communities adapted to the low annual precipitation and very dry, hot summers. The agriculture

of the area has developed within these restraints and almost all of the usable land in the county is devoted to dryland agriculture. The most important cash crop in 1974 was wheat, with lesser amounts of barley, oats and rye being grown. The total harvested area for all grains in 1974 was 130,700 acres with wheat accounting for 122,600 acres. However, the total number of acres devoted to grain production is closer to twice this figure because in most cases a grain crop is grown on a particular parcel of unirrigated land only every second year using the summer fallow method. By using this method, two years of moisture is held in the soil to grow one crop. In addition to grains, 4,800 acres of hay and 200 acres of other field crops were harvested in Gilliam County in 1974. Only about 1.7 percent (4500 acres) of these field crops are presently being grown under irrigation, the water being obtained from wells. The value of all field crops in 1974 was $19,527,000. The only other important agricultural product in Gilliam County is livestock. Approximately 14,000 head of cattle and 3,600 head of sheep were grazed on about 500,000 acres of dryland range in 1974. For the most part, this dryland range is the existing unirrigated shrub-grass vegetation (steppe). In the county, only about 6000 acres of this rangeland have been improved by seeding and/or brush removal. About 0.5 percent (2500 acres) of the total grazing land is presently in irrigated pasture. These pastures are used to graze cattle when they are not on dryland range. The value of all livestock in 1974 was $3,374,000. Thus, the Board finds that field crops and dryland livestock grazing account for over 761,000 acres of Gilliam County, which is almost all of the usable agricultural land (Hinchman following Tr. 599).

30. The construction and operation of the Pebble Springs Nuclear Plant will result in changes in the land-use patterns of the site and the contiguous 35,000 acres owned by Krebs Brothers, Inc. (Krebs). At present, the primary land use in the site area and of the Krebs parcel is dryland range. Approximately 2045 acres of this land, 0.4 percent of the rangeland in the county, will be modified or inundated due to the construction of the Plant and reservoir and thus will not be available for grazing. However, the Applicant has stated (see Ex. A-2, p. 8.1-7) that up to 2800 acre-ft. of irrigation water per year will be purchased by

Krebs as part of the nuclear plant site purchase agreement with PGE. The water will be used for irrigation of pasture to replace the dryland range lost by construction of the reservoir and the facility. The location of the land to be irrigated has not been identified at this time. Up to 25,000 gallons per day of water for livestock watering will also be made available to Krebs (Hinchman following Tr. 599). However, the Board finds that even if irrigation was not provided, only a very small portion of the agricultural production of the county (0.3 percent) would be lost (Tr. 671-73).

31. Based on data provided by the Gilliam County and Oregon State University Cooperative Extension Service, the Staff determined that the availability of reservoir water for the uses mentioned above will allow more cattle to be maintained in the site area than on the existing dryland range. If the water were used on cropland, it could increase grain production over the dryland summer fallow method predominant in the county (Hinchman following Tr. 599).

32. Average dryland range in Gilliam County will support approximately 0.02 animal units (one animal unit = one cow plus one calf) per acre for the 6-month grazing season (equivalent to 50 acres per animal unit). The 2045 acres lost due to the Plant would support less than 50 animal units (about 0.3 percent of the total production). Irrigated pasture will support two animal units per acre for the grazing season. Two thousand-eight hundred acre-ft. of water will provide about 933 acres of irrigated pasture (36 in. of water per acre per season) which will produce a net increase of 6,513,000 lbs. of dry forage per season over the 2045 acres of dryland range that will be lost. Thus, if all of the 2800 acre-ft. of available reservoir water is used to irrigate pasture, a net increase of 1825 animal units will be supportable in the county, based on a feeding rate of 20-25 lbs. of dry forage per day per animal unit. This is equivalent to a 37-percent increase in acreage of irrigated pasture and to a net economic gain of approximately $426,000 (12.6 percent) in Gilliam County livestock production, based on 1974 prices (Hinchman following Tr. 599).

33. The Board finds that if the 2800 acre-ft. of water were used to irrigate wheat cropland (1400 acres), the net economic gain for the county (1974 prices) would be approximately $456,900 (2.6 percent) assuming 2045 acres of dryland range (the area covered by the reservoir and Plant) were lost. The net economic gains cited above are the total value, at 1974 prices, of the agricultural products that could be produced assuming the availability of Pebble Springs reservoir irrigation water and the loss of 2045 nonirrigated acres due to Plant construction. These figures do not reflect any of the costs involved in producing these agricultural products, such as purchasing, pumping and conveying the water for irrigation or stock watering nor for maintaining the livestock during the 6 months they are not in pasture (Hinchman following Tr. 599).

34. The Staff balanced the agricultural benefits, due to the availability of irrigation water coupled with the long-term environmental benefits the reservoir may provide (see Ex. S-1, p. 5-16), against the very small losses in acreage of dryland range and agricultural production due to construction and operation of the Plant. No losses of cropland are anticipated. This comparison led the Staff to conclude that operation of the Pebble Springs Nuclear Plant should have a substantial net beneficial effect on the use of the land comprising the site and the Krebs' property and will not affect existing land-use patterns of the adjacent area (Hinchman following Tr. 599).

35. The Applicant also testified that little potentially productive agricultural land would be lost by construction of the Pebble Springs Nuclear Plant (Kathren following Tr. 300). They pointed out that according to soil maps prepared by the U. S. Soil Conservation Service in 1972, two-thirds of the site is nonirrigable and the remaining one-third is of marginal capability at best. Even if irrigation water were available at the 8700-acre Pebble Springs site, only about 1300 acres (approximately 15 percent) of the land could be cultivated for select field crops if special conservation practices were used; about 1650 acres (19 percent) would be marginal for the very few crops under very careful management. Of the 1900 acres lost by creation of the Pebble Springs reservoir, approximately 70 percent (1325 acres) is nonirrigable and the remainder

is of marginal capability. The soils at the site are shallow with either basalt bedrock, a gravelly hardpan or gravels within 3 ft. of the surface. They are highly susceptible to deflation and erosion if the vegetation cover is disturbed. If the site were not used for construction of the Pebble Springs Nuclear Plant, grazing of beef cattle and sheep would probably remain the primary agricultural use of this land for some time. (Kathren following Tr. 300; Tr. 501-05).

36. The State of Oregon also considered the removal of land from the site for agricultural production and consented to the same in a proposed Site Certificate Condition (Tr. 521-24).

37. The Board concludes that operation of the Pebble Springs Nuclear Plant would have a substantial net beneficial use of the land comprising the site and the contiguous property owned by Krebs Brothers, Inc., and will not affect existing land-use patterns of the adjacent area.

38. The Staff also evaluated the alternative cooling systems discussed in the FES, Section 9.3.1, specifically in terms of agricultural land use impacts. As a result of this evaluation, the Staff reaffirmed the conclusions expressed in Section 9.5 of the FES and the Board finds that the cooling reservoir is the most reasonable choice of cooling systems (Hinchman following Tr. 599). In terms of potential agricultural gains and losses, the Board finds that the cooling reservoir is as good, if not better, than the other cooling alternatives.

39. Some concern was expressed for recreational uses of the reservoir (Tr. 514-15, 2330-31). In the FES, the Staff concluded that the reservoir did not offer a viable recreational potential (Ex. S-1, p. 5-24). However, the Applicant accepted a condition in the proposed Site Certification Agreement which permitted short-term (less than 24 hours) recreational use of the site outside the 800-meter exclusion boundary (Tr. 515; Ex. O-2, Attachment 2, p. 9). Staff witness John Gill testified that in view of the fact that the kind of recreation the State was requiring did not involve direct contact with the reservoir water and was of a

short-term duration, the State's position was consistent with and acceptable to the Staff (Tr. 2730-33). We find accordingly.

40. The Applicant and Staff considered the impact of the operation of the transmission system on land use and the visual impact of the entire physical plant and transmission towers on nearby residents (Ex. A-2, Sections 3.1 and 5.6; Ex. S-1, pp. 5-1 and 5-2). The Board finds that these effects will be minor and, as such, are acceptable.

Water Use

41. Waste heat generated by the Pebble Springs plant will be dissipated to the atmosphere by means of a cooling pond (Pebble Springs reservoir) and the blowdown will be used for irrigation. This will eliminate thermal and chemical discharges to the Columbia River. During Plant operation, makeup water equivalent in volume to the combined irrigation, evaporative and seepage losses of reservoir water will be pumped from the Columbia River. In the absence of discharge to the river, the only impact on water use accompanying Plant operation is the consumptive use of makeup water from the Columbia River. This makeup water amounts to about 100 cfs during warm months. This is only 0.2 percent of the calculated 7-day, 10 yr. low flow (47,000 cfs) past Arlington. Water use downstream of Arlington to the Pacific Ocean amounts to approximately 1000 cfs according to the Oregon State Engineer's Office and the State of Washington, Department of Ecology. When compared to the average discharge of the Columbia River at its mouth (262,000 cfs), water use of 100 cfs is negligible. An additional consumptive use of 100 cfs by the Plant is not expected to have any adverse impact on the other downstream uses of the Columbia River (Ex. S-1, p. 5-2). We so find.

42. Seepage from the Pebble Springs reservoir is expected to add approximately 6600 acre-ft. (9 cfs) annually to the groundwater of the vicinity. The groundwater aquifers at the site are both deep and shallow. Due to impervious deposits, seepage from the reservoir is not expected to reach the lower aquifers; whereas, some seepage may recharge

the shallower aquifers. In addition, new perched aquifers may be established in unconsolidated deposits overlying the basalt flows in the immediate area of the reservoir. The Applicant indicates no plans for the withdrawal of groundwater for any purposes during Plant operation (Ex. S-1, pp. 5-2 and 5-3). Also, a comparison of the maximum projected concentrations of various chemical constituents of Pebble Springs reservoir (Ex. A-2, Table 5.4-1) with the average chemical analysis of groundwater sources in the area (Ex. A-2, Table 5.4-2) indicates that reservoir seepage will have little effect on groundwater quality. Thus, we find there will be no adverse impacts on groundwater quality, groundwater levels and/or groundwater aquifers.

Heat Dissipation System

43. Both the Applicant and the Staff evaluated the thermal performance of the cooling reservoir (Ex. A-2, Section 5.1; Ex. S-1, Section 5.3.2 and Appendix C). The Board questioned the adequacy of these analyses (Tr. 91-93). Consequently, the Staff presented supplemental testimony pertaining to the thermal plume model (Marmer following Tr. 601; Tr. 664-71).

44. The Board finds that almost all predictive models treat cooling ponds as simple, completely mixed or plug flow ponds as described in Appendix C of the FES. The reason for this is that many of the heat and mass transfer processes that occur in a real lake or pond are often too complicated to model. Decisions must be made whether or not they can be ignored in a given situation. Some complications such as the presence of side arms (areas of the lake not in the main flow) or entrance mixing can be handled in a variety of ways, all which are approximations to the true situation at hand (Marmer following Tr. 601, p. 1).

45. Other phenomena that are easy to understand and very important to the cooling process are extremely difficult to formulate analytically. The best example is heat transfer due to evaporation. Several different formulae have been proposed and can be found in the literature. They are all functionally dependent upon the wind speed, but, to date, no

definitive analysis has been performed to determine which evaporation formula yields results closest to reality. In fact, since this term is so site specific, it is very likely that such a task would be impossible (Marmer following Tr. 601, p. 1).

46. The Staff addressed the Board's concern that the circulation time of 8.5 days stated in the FES might be inaccurate since its calculation involved the entire volume of the lake. If the cooling pond is strongly stratified, then only the epilimnion can be considered as a plug flow pond and it is true that the circulation time will be less than 8.5 days (Marmer following Tr. 601, p. 4). However, the cooling method is primarily a surface phenomenon and since the lake area does not change, the temperature predictions are still valid. This can be seen from equations (4) and (10) of Appendix C of the FES. The temperature at the cool end of the lake is given by

$$\frac{T_F - E}{T_O - E} = e^{-kt_F/\rho C_p L}$$

However, the term t_F/L in the exponential is just the ratio of the surface area of the lake A to the plant flow rate Q. In this form

$$\frac{T_F - E}{T_O - E} = e^{-kA/\rho C_p Q}$$

so that the temperature predictions are seen to be area and flow rate dependent alone (Marmer following Tr. 601, p. 4).

47. Based on the foregoing, the Board finds that temperature predictions for the Pebble Springs reservoir, notwithstanding the difficulties inherent in analytically modeling a cooling pond accurately, are conservative.

48. The Applicant used an empirical model to predict the occurrence of steam fog over the Pebble Springs cooling pond (Ex. A-2, pp. 5.1-5 through 5.1-11). The Staff reviewed the Applicant's calculations and the experience at existing cooling ponds. (Ex. S-1, pp. 5-6 and 5-7). The Board finds that there will be little atmospheric effect from the formation of steam fog over the reservoir during cold weather periods.

Nonradiological Effects on Ecological Systems

49. The impacts on the terrestrial environment due to Plant operation will primarily be associated with the reservoir itself and with the use of its water for agricultural purposes (stock watering and irrigation) (Ex. S-1, p. 5-15). The reservoir will provide a number of long-term gains, including new and varied wildlife habitat in the riparian vegetation that will develop around the perimeter of the reservoir (Ex. A-2, p. 5.8-2). The Staff agrees that the establishment of riparian habitats around the reservoir would be a beneficial environmental effect. Even after operation of the Plant has begun, the ecological diversity of this region will be greater than that of the existing habitat. However, the relatively high water temperature and the resultant higher-than-ambient temperatures in the immediate vicinity of the reservoir perimeter that will prevail year-round after operation begins may limit the diversity of this flora and fauna to those species capable of tolerating such conditions (Ex. S-1, p. 5-16).

50. The areas traversed by the transmission lines are semi-arid and nonforested. Line maintenance will not involve any clearing. Because of the low growth forms of the vegetation, no herbicides to retard tall-growing brush or trees will be required, nor will pesticides be used (Ex. A-2, p. 5.6-1). Coronal discharge of high-voltage transmission lines is one source of ozone formation. The Applicant has stated that the size and geometry of the conductor system to be used for the 500-kV and 230-kV lines will be optimized to minimize corona discharge and ozone production (Ex. A-2, p. 5.6-1). The Board does not expect any detectable effect of ozone production on vegetation in the vicinity of these lines.

51. Withdrawal of water from the Columbia River during operation of the Plant will result in entrained organisms being carried to the reservoir and in fish impinging on the intake screens. The Staff estimates that about 0.056 percent and 0.2 percent of the river's plankton will be lost during average flow and low flow, respectively. Phytoplankton have generation times on the order of several hours to days and losses of this proportion of the river's population is considered by the Staff to be

negligible. Zooplankton have somewhat longer generation times, but loss of 0.2 percent of these populations from the John Day pool is not expected to have adverse effects on the river. In winter, when plankton populations are expected to be lower due to colder water, the makeup water withdrawn from the river will also be lower, about 52 cfs. This represents about 0.01 percent of the river at low flow (Ex. S-1, pp. 5-17 and 5-18).

52. As discussed in Section 2.7 of the FES, as far as is known, salmon spawning does not occur in the John Day pool, but mainly in the tributaries of the Columbia River and in "the Hanford reach". Likewise, little or no spawning of resident freshwater fish occurs in the river mainstream in the area of the station intake. Fry of salmon and trout in the tributaries and the river would be subject to entrainment; loss of 0.2 percent of these at most is expected to have negligible effect on the river's fish populations or food resources (Ex. S-1, p. 5-18).

53. A possible adverse impact is the impingement of fish on the intake screens, resulting in fish mortality due to injury, asphyxiation and/or exhaustion. As discussed in Section 2.7 of the FES, juvenile migrants of several species of Columbia River fish seem to prefer the shallower waters along the shorelines. These fish thus would be susceptible to impingement on the traveling screens. The Applicant has designed the intake structure with the aim of minimizing these impingement effects (see ER Figures 3.4-10 and 3.4-11). The Staff's evaluation indicates that this design has several features that will tend to lessen fish impingement. The Staff will require a fish impingement monitoring program at the time of application for an Operating License to verify the effectiveness of these features (Ex. S-1, p. 5-18).

54. The Staff has conducted a detailed evaluation of the effects of nutrient content and thermal input on the developing ecology of the reservoir. After the Plant begins operation, the Pebble Springs reservoir will become a relatively "hot (heavily loaded) reservoir" with the water temperature of the intake end of the reservoir unlikely to ever fall below 85°F even during the coldest period of the year. Such temperature extremes will greatly reduce available biological habitat and will

be inimical to the reproduction and/or sustained maintenance of many reservoir biota which have developed prior to Plant operation. Although thermal stratification will occur in the deeper areas of the reservoir, oxygen levels will probably be insufficient to support fish life (Ex. S-1, pp. 5-18 through 5-21).

55. As discussed previously, the Board found that the availability of reservoir water for irrigation and stock-watering purposes is a beneficial impact to the region. However, without careful attention to its use, some adverse terrestrial impacts could result. One of these, which the Board considered in detail, was the potential for salt buildup in the reservoir and the associated monitoring program and management necessary to properly control this buildup (Tr. 94, 470-72, 2321-26).

56. In the ER, the Applicant stated that the water in the Pebble Springs reservoir will be of suitable quality for irrigation of alfalfa and other crops likely to be grown in the area (Ex. A-2, p. 5.4-3). They also provided further evidence supporting their conclusion (Christensen following Tr. 292 and 903; Tr. 1007-13, 1360-67). The Staff also considered the potential problem of chemical buildup in the reservoir and, with an expected reservoir concentration factor of six, concluded that water would be suitable for agricultural use (Hinchman, Tr. 674-75).

57. Based on the Applicant's analysis of expected chemical concentration in the reservoir and comparison to EPA water quality recommendations for irrigation and livestock-watering (Christensen following Tr. 903), the Board finds that the reservoir water will be suitable for irrigation and livestock-watering purposes from the standpoint of chemical content.

58. The State of Oregon pointed to differences in the levels of concentrations of copper, zinc and fluoride in the Pebble Springs reservoir in the FES and the proposed State Site Certification Agreement [see Ex. S-1, Table 3.5 and p. A-16 (Item 2); Ex. O-2, Attachment 2, p. 14 of the Site Certification Agreement; Tr. 467-68 and 2732]. The State Site Certification Agreement would require lower concentrations of these

constituents than the FES. The Applicant has agreed to abide by the lower concentrations contained in the State's proposed Site Certification Agreement (Tr. 467). The Staff clarified their position by stating that the FES estimated what the chemical concentration levels in the reservoir would be, for purposes of environmental impact assessment, as opposed to the levels set in the proposed Site Certification Agreement which were established by authority of the State of Oregon Department of Environmental Quality. The Staff agreed with the State's proposed requirements in this regard, as does the Board (Tr. 2731-32).

59. The land to be irrigated is not precisely defined at this time but may consist of well-drained soils and shallow soils. If deep, well-drained soils of moderate permeability are irrigated with water from the Pebble Springs reservoir, little physical or chemical change that would make the soil unsuitable for agricultural use is expected to result. If shallow soils with a high water table or bedrock and/or an impervious hardpan near the surface are irrigated, salinity or alkalinity problems may result from sustained application (Ex. S-1, p. 5-3; Tr. 674-75). However, the Applicant testified that the monitoring program, at a minimum, will consist of analyses of the influent circulating cooling water to the Plant. This monitoring will be part of the regular operating procedures for the Plant. If the concentrations of salt ever did approach those concentrations which had been previously determined to be deleterious to crop growth, the Applicant would immediately inform the users of the reservoir water. The Applicant has also committed to its own irrigation if it ever becomes necessary to maintain lower concentrations of salt in the reservoir. Land to the north of the Pebble Springs reservoir has been retained within Applicant ownership to meet this obligation (Christensen following Tr. 292; Tr. 390-91).

60. There was concern expressed by the Board concerning possible blue-green algal blooms in the proposed cooling reservoir and their effect on both waterfowl and cattle (Tr. 93-94). Both the Applicant and the Staff presented testimony in this regard (Ex. O-1; Ex. S-1, pp. 5-22 through 5-24; Zussman following Tr. 597).

61. It is not possible to accurately predict the occurrences or species composition of an algal bloom, due to the numerous factors which are believed to be contributory to such a phenomena. The Staff indicated that while the probability of a toxic algal bloom in the cooling pond is very low, the possibility of such an occurrence warrants extensive control measures (Tr. 628; Zussman following Tr. 597).

62. Dr. Kaczynski, the Applicant's witness, relied on actual experience with cooling water reservoirs in drawing his conclusions. He believes it is improbable that a classical blue-green bloom will ever occur because of continued nutrient availability for all the algal forms (thus preventing overdominance by the blue-green algae) caused by the predicted mixing of the reservoir and continual renewal of nutrients throughout the year (Ex. O-1, p. 10; Tr. 409-10, 548-49). He also believes that the possibility of a toxic blue-green bloom is even less likely based on documented studies of blue-green blooms in eastern Oregon and Washington (Ex. O-1, pp. 10 and 11). Dr. Kaczynski also proposed a reservoir monitoring program for detecting trends in algal development and a generalized contingency plan for algal control (id., pp. 12 through 15).

63. Notification of water users under contract should be adequate to protect livestock in case a toxic algal bloom begins to develop (Ex. S-1, pp. 5-23 and 5-24). Although in the absence of preventive control measures this action would not provide absolute protection of waterfowl or other wildlife using the reservoir water, waterfowl usage of the reservoir is not during the period of the year when algal blooms would occur (Tr. 551-52, 660-61).

64. Based on the available evidence, the Board finds that the probability of a toxic algal bloom in the Pebble Springs cooling reservoir is very low and that the preoperational and operational monitoring program proposed by the Applicant is adequate to predict algal occurrences. We also find that adequate control technologies could be applied to prevent algal blooms from occurring or mitigate their occurrence in the unlikely event they develop (Zussman following Tr. 597, pp. 2 through 5).

Socioeconomic Effects

65. Both the Applicant and the Staff reviewed the social and economic impacts of Plant operation (Ex. A-2, Section 11.3; Ex. S-1, p. 5-24). The Board finds that, in comparison to the Plant construction stage, the influx of permanent workers will be modest and acceptable.

Radiological Effects

66. During the normal operation of the Pebble Springs Nuclear Plant, radioactive material will enter gaseous and liquid waste streams. These streams will be processed and monitored within the Plant to minimize the quantity of radioactive nuclides ultimately released to the environment. (Ex. S-1, p. 3-8).

67. Both the Applicant and the Staff evaluated the expected quantitites and effects of radiological releases during normal Plant operation. The Applicant's description and evaluation of the radwaste systems design is presented in the ER (Ex. A-2, Sections 3.5, 5.2 and 5.3) and the PSAR (Ex. A-1, Section 11.0). The Staff's is contained in the FES (Ex. S-1, Sections 3.5 and 5.4).

68. The Staff presented testimony on the "as low as reasonably achievable" radioactive releases as set forth in 10 CFR Part 50, Appendix I (Weller and Gotchy following Tr. 2864). This testimony updated the presentation contained in the FES (Section 5.4.2) and Supplemental Staff testimony (Essig following Tr. 595 and 1252; Cardile following Tr. 1250; and Grotenhuis following Tr. 1255) and included the results of a detailed Staff assessment of the matter. Specifically, the Staff evaluated the radioactive waste management systems proposed for Pebble Springs (Weller and Gotchy following Tr. 2864, p. 2) and based on more recent data and on changes to the Staff's calculational model, generated new liquid and gaseous source terms to determine conformance with Appendix I (id, p. 3). Included in the Staff's analysis were dose evaluations of three effluent categories: (1) pathways associated with liquid effluent releases to the Pebble Springs cooling reservoir; (2) noble gases released to the

atmosphere; and (3) pathways associated with radioiodines, particulates, carbon-14, and tritium released to the atmosphere (id, p. 3). The Staff concluded that the doses associated with the normal operation of Pebble Springs meet the design objectives of Sections II.A, B, and C of Appendix I and that the expected quantity of radioactive materials released in liquid and gaseous effluents and the aggregate doses meet the design objectives set forth in RM-50-2 (id, p. 7). Further, the Staff's evaluation showed that the Applicant's proposed Pebble Springs design satisfies the criteria specified in the option provided by the Commission's September 4, 1975 amendment to Appendix I and therefore meets the requirements of Section II.D of Appendix I (id, p. 7). In sum, the Staff found that Pebble Springs' proposed liquid and gaseous radwaste management systems met the criteria set forth in Appendix I and are therefore acceptable (id, p. 8).

69. In Section 5.4.2.7 of the FES, the Staff estimated the radiological impact on the general pubic within 50 miles of Pebble Springs resulting from all effluent pathways. These estimates were subsequently revised by the Staff to provide an upper-bound estimate of the radiological impact to the general public from normal operation of the Pebble Springs facility (Cardile following Tr. 1250; Essig following Tr. 1252; and Grotenhuis following Tr. 1255). We find that the estimated total annual population dose of 320 man-rem, even as a conservative upper bound, is negligible compared to an annual total of about 8070 man-rem delivered to the same population as a result of the average natural background dose rate of about 0.107 rem per year in the vicinity of Pebble Springs (Essig following Tr. 1252, p. 3; Ex. S-1, p. 5-15). By comparison, we note the Applicant more realistically estimated that the corresponding total annual population dose would be 3.0 man-rem per unit (Frewing following Tr. 5086). We also find that the 900 man-rem estimated as occupational onsite exposure is a small percentage of the annual total dose received by the population within 50 miles of the site from natural background (Ex. S-1, p. 5-15).

70. At the initial session of evidentiary hearings in June 1975 the State of Oregon pointed out that during the site certification

proceedings before it, the Applicant had represented that there would be no discharge of radioactivity in liquid effluents (Ex. O-2, pp. 2 and 3; Tr. 514).

71. By way of background on this matter, the Board notes that early in the design of the Pebble Springs Nuclear Plant, PGE established a criterion to not discharge any potentially radioactive liquids from the Plant to the environment. The basis for this criterion was that the dilution capacity of the cooling reservoir was too limited to receive more than a fraction of a curie per year discharge of nuclides other than tritium, and the Columbia River was too distant to consider the piping away of low-level liquid radioactive wastes for dilution there. This criterion was documented in the State of Oregon proposed Site Certificate Application, the ER and the PSAR. In line with this criterion, the liquid radioactive waste treatment systems for the Plant were, and still are, designed to accommodate the expected annual volumes of liquid waste that might potentially be radioactive (Grund following Tr. 295, p. 8).

71a. The Applicant testified that, in the fall of 1974, several concerns came into focus which raised questions about the desirability of not discharging any liquids from the Plant. First, experience accumulated by Babcock & Wilcox (B&W), the nuclear steam supply system manufacturer, with their once-through steam generators indicated that neither the rate of leakage of primary coolant into, nor levels of radioactivity at any point in, the secondary system were measurable. Second, the processing of essentially nonradioactive wastes involved unnecessary costs. Third, equipment outages in the waste processing system stood to possibly decrease the overall reliability of the Plant since the Plant would have to be shut down if liquid waste could not be either discharged or processed. Fourth, it was realized that design provisions could be made for segregating and piping essentially nonradioactive secondary system wastes to the cooling reservoir without running the risk of inadvertently discharging radioactive waste from other Plant systems through the same pipe. (id., p. 9).

71b. The culmination of these concerns resulted in a change in the design criterion for liquid wastes and a consequent change in Plant design which would provide for the discharge of essentially nonradioactive secondary system liquid waste to the cooling reservoir. These changes were documented in a November 19, 1974 amendment to the PSAR and in a May 20, 1975 amendment to the ER. The NRC Staff analysis presented in the FES was based on the revised Plant design. (id, pp. 9-10).

71c. This Plant design change incorporated a supplemental waste holdup tank to automatically collect only those secondary system liquid wastes which are determined by an inline radiation monitor to have a total activity of less than 10^{-6} µCi/cc, excluding tritium. Wastes having greater activity are automatically routed to the liquid waste treatment system for processing. Waste that is collected in the supplemental waste holdup tank is monitored by sampling and analysis as well as by a second inline radiation monitor, and, if the activity is less than 10^{-6} µCi/cc, it can then be discharged to the cooling reservoir. During discharge, if the waste activity were to exceed this activity level, discharge would be automatically terminated. (id, p. 10).

71d. The Applicant explained that the release limit of 10^{-6} µCi/cc, excluding tritium, for secondary system liquid waste was derived from the proposed 10 CFR 50, Appendix I dose limit of 5 mrem/yr to the whole body or any organ, by all exposure pathways, from both reactors to be located at the site. For design purposes it was very conservatively assumed that the entire annual volume of secondary system liquid waste from both reactors is discharged to the reservoir at a total activity of 10^{-6} µCi/cc, excluding tritium. Using conservative environmental usage assumptions, annual releases of this magnitude were estimated to deliver a maximum of 5 mrem/yr dose to the maximum exposed individual of the public. The activity discharge limit of 10^{-6} µCi/cc also represents the minimum detectable activity that can be measured by state-of-the-art inline process radiation monitors. (id, p. 11).

71e. The Applicant's witness, John E. Grund, reaffirmed the Applicant's commitment to the State of Oregon indicating that they would not

discharge any potentially radioactive liquid effluent from the Plant to the cooling reservoir unless the matter first was resolved with the State of Oregon. In order that the hearing record could be closed on the subject, the Applicant asked the Board to base its findings on both a plant design with no discharge of liquid waste and the plant design documented in the FES, the PSAR and the ER with discharge of secondary system liquid waste with an activity less than 10^{-6} μCi/cc, excluding tritium (id, pp. 11 and 12).

72. At the Board's request, the Applicant provided further testimony concerning the incremental costs of not discharging secondary liquid waste into the Pebble Springs cooling reservoir (Frewing testimony dated May 13, 1977 following Tr. 5086). This testimony updated earlier testimony provided by the Applicant on this subject (Grund following Tr. 295) by reflecting evolutions in Plant design and effluent dose evaluation models. The Applicant further supplemented this testimony following additional questions by the Board at the June 23, 1977 prehearing conference (Frewing testimony dated July 25, 1977 following Tr. 5086). Both the May 13 and July 27, 1977 submittals by the Applicant were received into evidence as Ex. A-31. Also in response to the Board's request, the NRC Staff presented testimony on the potential impact of zero liquid radwaste discharge on the benefit-cost balance contained in Section 10.4 of the FES (Weller following Tr. 5189).

73. The Applicant analyzed the incremental costs of two cases: Case 1, representing the situation where all secondary system liquid waste is discharged to the Pebble Springs reservoir; and Case 2 representing the situation where no secondary system liquid waste is so discharged. For each case, the Applicant considered two subcases: Subcase A, an anticipated volume of secondary system liquid waste; and Subcase B, a potentially larger volume of secondary waste. The Applicant concluded that the cost of not discharging secondary wastes far exceeds the dose reduction benefits to be gained (Frewing following Tr. 5086).

74. The Staff's analysis of zero liquid radwaste discharge was conducted on the assumption that the Applicant had committed to a "true"

zero-release plant (ie, one which discharges zero radioactive liquid effluents). The Staff evaluated the Applicant's estimated incremental operating costs associated with zero liquid radwaste discharge during normal Plant operation and found the estimates to be reasonable and consistent with the Staff's independent evaluation of the operating costs. The Staff further concluded that the incremental costs associated with zero liquid radwaste discharge are less than 0.2 percent of the total economic costs of construction and operation of the Plant and will have no significant impact on the benefit-cost balance presented in Section 10.4 of the FES. Additionally, the Staff evaluated the potential radiological impact of processing secondary system liquid radwastes and determined that the impact of the additional occupational exposures because of this processing mode compared to the expected occupational exposure associated with the operation of the facility will be minimal and will not upset the benefit-cost balance presented in Section 10.4 of the FES (Weller following Tr. 5189).

75. In the Applicant's analysis the entire annual volume of secondary system liquid waste was assumed to be discharged to the Pebble Springs reservoir at a total concentration of 10^{-6} µCi/cc, excluding tritium (Frewing following Tr. 5086, p. 3). The Applicant clarified that the intent of the 10^{-6} µCi/cc limit was a design objective rather than an operational limitation. The Applicant stated that operational limitations would be established by Technical Specifications at the operating license stage to ensure compliance with Appendix I (Tr. 5240-41). The Applicant prefers not to limit discharges to the reservoir at a predetermined set-point but rather to allow the effluent monitors to vary within a range which will ensure that cumulative annual discharges conform with the design objectives of Appendix I and thereby permit more flexible operation of the Plant (Tr. 5102-07, 5263-64, and 5291).

76. Based on the Applicant's testimony clarifying the expected mode of Plant operation, the Staff testified that their Appendix I analysis no longer reflected a realistic evaluation of expected radiological releases in that the Staff assumed that all wastes with concentrations in excess of 10^{-6} µCi/cc would be processed, whereas the Applicant stated that wastes

with concentrations above 10^{-6} µCi/cc may be discharged to the reservoir (Tr. 5272-74; 5303). However, the Staff also testified that their evaluation of the impact of zero liquid release operation on the NEPA cost-benefit balance (see Weller following Tr. 5189) was unaffected by the Applicant's clarifications regarding changes in the Plant operating mode (Tr. 5274-78).

77. Based on our review of the present state of the record, we find that the incremental costs associated with zero liquid radwaste discharge will have no significant impact on the benefit-cost balance presented in Section 10.4 of the FES. The Board also finds that the potential radiological impact of processing all secondary system liquid radwastes on expected occupational exposure will be minimal and will not upset the benefit-cost balance presented in Section 10.4 of the FES.

78. The Board notes that the Staff is to revise their previous testimony of July 29, 1976 (following Tr. 2864) concerning the evaluation of the liquid radwaste system with respect to Appendix I and determine the effect of this revision on the overall cost-benefit balance (Tr. 5297-98). We will consider the Staff's revision in future hearings.

E. ENVIRONMENTAL MONITORING

79. The Applicant submitted to the Staff a preoperational monitoring program and a proposed operational monitoring program. (Ex. A-2, Sections 6.1 and 6.2) The program was reviewed by the Staff and several inadequacies were noted regarding the terrestrial, aquatic and radiological monitoring programs. To correct these inadequacies, the Staff recommended certain modifications which the Applicant agreed to make (Ex. S-1, pp. 6-2 through 6-4; Tr. 509-13).

80. By way of background we note that on June 18, 1976, Project Survival and several individuals filed an "Intervenors-Petitioners Motion to Reopen the Record and to Admit Petitioners as Parties". On July 15, 1976, this Board issued an order authorizing further discussion regarding intervenor's Contention D-18 through D-23 concerning fish and wildlife

impacts but denied the remainder of the motion. The basis for our ruling was a letter from a Regional Director of the United States Department of the Interior's Fish and Wildlife Service (FWS), attached to Intervenors-Petitionors' motion as Exhibit A. The letter was written in response to a "Freedom of Information Act Request" a copy of which was also attached to the motion. In the letter, Mr. James W. Teeter made the following statement:

> "It is our belief that coordination between NRC and USFWS regarding fish and wildlife aspects of the proposed Pebble Springs power plant has fallen short of what we perceive to be the requirements of the [Fish and Wildlife] Coordination Act."

81. The subject contentions and letter were discussed at the evidentiary hearing in Portland, Oregon on July 29 and 30, 1976 (Tr. 2753-90, 3042-46). Based on these discussions, and prior communications between the NRC Staff and the FWS, the Board denied the motion of Project Survival and the other petitioners with respect to the contentions listed and also the admission of these petitioners as intervenors in the proceeding. However, the Board requested further information in regard to coordination between the NRC and FWS to assure a more complete record (Tr. 3234-37).

82. Pursuant to the Board's request, Mr. Richard D. Giger of the FWS testified as to the FWS's concerns and recommendations regarding fish and wildlife aspects of the Pebble Springs Nuclear Plant (Giger following Tr. 3305). Mr. Giger made it clear that the FWS was not opposing the proposed plant with regard to anticipated impacts on fish and wildlife, either from site selection, cooling technology or other project features since the project appears to have been planned in a manner that would avoid significant impact to fish and wildlife (Id. at pp. 1 and 2; Tr. 3308-13, 3372, 3376). However, Mr. Giger did express concern about the adequacy of the existing process of identifying site resources and potential impacts, designing and initiating a monitoring program, and most importantly, during these processes establishing coordination with

other State and Federal agencies responsible for fish and wildlife conservation. (Giger following Tr. 3305, pp. 1 and 2; Tr. 3306, 3314).

83. Mr. Giger presented a summary table of the fish and wildlife monitoring program for Pebble Springs that the FWS had prepared in cooperation with the Applicant, the National Marine Fisheries Service and the Oregon Department of Fish and Wildlife (Giger following Tr. 3305, Attachment 5; Tr. 3306-07). This summary table failed to differentiate between preconstruction studies and post-construction studies (Tr. 3368-84)

84. This discovery prompted NRC Staff, the FWS, the Applicant, the National Marine Fisheries Service and the Oregon Department of Fish and Wildlife to make three major changes to the preoperational montoring program of fish and wildlife at Pebble Springs. The revised program involves three separate pre-construction studies; fish studies in the Columbia River relative to where the intake structure would be located, vegetation and habitat analysis of the site and bird abundance studies. (Tr. 3927-32) Mr. Giger testified that the modified preoperational monitoring program adequately incorporated the FWS's concerns and that the revised studies would provide the necessary data for construction and operational comparison (Tr. 3963, 3956). The FWS is also satisfied that the baseline studies to date were adequate to identify significant species and resources and for estimating significant impacts that might be cause for some kind of mitigation or compensation measures or management plans (Tr. 3970-72).

85. Based on our review of the record, the Board finds that the preoperational monitoring program, as modified to incorporate the concerns of the FWS as discussed, is adequate and acceptable.

F. ENVIRONMENTAL EFFECTS OF POSTULATED ACCIDENTS

86. The environmental effects of accidents have been assessed by the Applicant in the ER and by the Staff in the FES (see Ex. A-2, Section 7.0; Ex. S-1, Section 7.0). The Staff has reviewed the Applicant's assessment, has made independent calculations and has concluded that the

realistically estimated radiological consequences from so-called "design basis accidents" (accident Classes 1 through 8) would result in exposures of an assumed individual at the site boundary which are less than that which would result from a year's exposure to the Maximum Permissible Concentrations (MPC) of 10 CFR Part 20 (Ex. S-1, p. 7-4). However, the Applicant and Staff did not assess the effects of accidents beyond the design basis, ie, Class 9 events. The FES states (p. 7-4) the follcwing:

> "The postulated occurrences in Class 9 involve sequences of successive failures more severe than those required to be considered in the design bases of protection systems and engineered safety features. Their consequences could be severe. However, the probability of their occurrence is judged to be so small that their environmental risk is extremely low. Defense in depth (multiple physical barriers), quality assurance for design, manufacture and operation, continued surveillance and testing, and conservative design are all applied to provide and maintain a high degree of assurance that potential accidents in this class are, and will remain, sufficiently small in probability and that the environmental risk is extremely low."

87. On June 13, 1980 the Commission promulgated a Statement of Interim Policy entitled "Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969 (45 FR 40101). This interim policy withdrew the proposed Annex to Appendix D of 10 CFR Part 50, published on December 1, 1971. It also provides that:

1. The Staff does not need to initiate treatments of accident considerations, in accordance with the guidance in the Statement of Interim Policy, in its ongoing NEPA reviews, for any proceeding at a licensing stage where a Final Environmental Impact Statement has been issued.

2. The change in policy is not to be construed as any lack of confidence in conclusions regarding the environmental

risks of accidents expressed in any previously issued Statements, nor, absent a showing of similar special circumstances, as a basis for opening, reopening, or expanding any previous or ongoing proceeding.

3. The intent of the Commission is that the Staff take steps to identify additional cases that might warrant early consideration of either additional features or other actions which would prevent or mitigate the consequences of serious accidents. Cases for such consideration are those for which an FES has already been issued at the Construction Permit stage but for which the Operating License review stage has not yet been reached. In carrying out this directive, the Staff should consider relevant site features, including population density, associated with accident risk in comparison to such features at presently operating plants. Staff should also consider the likelihood that substantive changes in plant design features which may compensate further for adverse site features may be more easily incorporated in plants where construction has not yet progressed very far.

88. Based on the provisions and directives contained in the Statement of Interim Policy regarding accident considerations under NEPA, the Board finds that the Applicant's and Staff's previous review of the environmental risks of accidents is acceptable within the scope of that review and, absent a showing of special circumstances, need not be considered further. The Board further finds that, based on its own review of relevant features for the Pebble Springs site (Section III of these findings) and until the Staff determines otherwise, early consideration of either additional features or other actions which would prevent or mitigate the consequences of serious accidents is not warranted.

G. ENVIRONMENTAL EFFECTS OF TRANSPORTATION OF RADIOACTIVE MATERIAL

89. Transportation of fuel to and from the site and of radioactive waste from the site will be in accordance with Commission regulations and requirements of the Department of Transportation (Ex. A-2, Sections 3.8 and 5.3.4.2). Under normal shipping conditions, there will be small unavoidable radiation exposure to the transportation personnel and to the general public along the route (Ex. S-1, Table 5.3). Under postulated accident conditions, the probability of significant exposure is also small (Ex. S-1, Table 7.3). Since the facilities at Pebble Springs, their operation, and associated activities are as described at 10 CFR 51.20(g)(2), the environmental impact of the transportation of fuel and radioactive waste to and from the plant is as described in Summary Table S-4 of 10 CFR 51.20 and is negligible.

H. ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE

90. The environmental consequences of the uranium fuel cycle associated with the operation of the Pebble Springs Nuclear Plant were considered in the FES (dated April 1975) by including Table S-3 of 10 CFR Part 51 and by factoring those consequences into a cost-benefit balance. On March 7, 1977, the Commission promulgated its final interim rule as to environmental impact values for the uranium fuel cycle which amended Table S-3.

91. In a September 21, 1977 memorandum to James Yore, Chairman, Atomic Safety and Licensing Board Panel, one of the members of this Board pointed out that the value in Table S-3 for the amount of radon (Rn-222) release to the atmosphere did not accurately represent all sources of radon releases from the uranium fuel cycle.

92. Subsequently, on April 11, 1978 the Commission amended Table S-3 by removing the value contained in the table for radon releases from the uranium fuel cycle (43 FR 15613). The Commission directed that in proceedings pending before licensing boards the record be reopened for the limited purpose of receiving new evidence on radon releases and on health effects resulting from radon releases.

93. In accordance with the Commission's directive, evidence was received by the Board on the amount of radon that might be released into the environment resulting from the mining and milling of an amount of uranium sufficient to supply the Pebble Springs Nuclear Plant for 40 yrs. of operation. The subsequent health effects were also considered. (See Staff testimony following Tr. 4273, 4276, 4280, and 5442). This testimony included the Staff's most recent estimates of Rn-222 releases from mining and milling operations and an evaluation of the health effects resulting from such releases. The Applicant and intervenors filed no testimony on these issues.

Radon from Mining

94. Rn-222 is one of the natural products of the decay of U-238, which has a half-life of 4.5 billion years. The precursors of radon are all solids, two of them of long half-life - Th-230 with 80,000 yrs. and Ra-226 with 1,600 yrs. Radon is a gas having a half-life of 3.8 days, and it readily diffuses through the soil or ore body; the amount reaching the atmosphere depends on the length of the path (and hence the lapse of time) between the origin of the radon (the ore body) and the air interface. Typically 2 ft. of soil will hold up the radon long enough to permit about 25 percent of the radon to decay, allowing 75 percent to escape. If a body of uranium ore is exposed to the air, radon gas will escape into the air. The process will continue so long as the ore body is exposed. (Magno following Tr. 4276, p. 9; Gotchy following Tr. 5442, Figure 2).

95. Staff's witness R. M. Wilde explained how he arrived at an estimated quantity of 4,060 Ci of Rn-222 per annual fuel requirement (AFR)[3] associated with mining. It was calculated from an estimate of the concentration of radon in the ventilating air from an underground mine

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[3] About 57 days is required to mill the 2.7×10^5 tons of 0.1 percent uranium ore required to fuel a 1,000-MWe plant operating at 80 percent capacity for 1 yr.

multiplied by the amount of air pumped from the mine during the time required to extract 2.71 x 10^5 metric tons of ore (1 AFR) from the mine (Wilde following Tr. 4273, pp. 2-5). Since mine ventilation ceases when the mine is closed down, the mine does not constitute a continuing source of radon (Tr. 4541-42). This value was used by Gotchy (following Tr. 4280) in his estimates of health effects from mining. We adopt it as a reasonable estimate.

96. The Board expressed a concern that abandoned underground mines could continue to be a source of radon release to the atmosphere and questioned Mr. Wilde concerning this. Mr. Wilde indicated that essentially all mining laws require ventilation and hoisting shafts of mines no longer producing uranium to be sealed. Moreover, even if the shafts were not sealed, when the ventilation fans were shut down radon release would essentially go to zero (Tr. 4541-42).

97. Mr. Wilde testified that there was insufficient data to predict with certainty the potential rate of radon emission from open-pit mining operations (Wilde following Tr. 4273, p. 7). Open-pit mining constitutes about half of the present uranium mining activity (Tr. 4364). Though this may be anticipated to become a decreasing portion in the future (Tr. 4364, 4566-67), the Board was interested in any estimates of potential radon released from open-pit mining (Tr. 4544-45). Using conservative assumptions, Mr. Wilde calculated a value for radon release from open-pit mines of approximately 110 Ci/yr./AFR (Tr. 4548-52, 4557-62).

98. If one assumes that an open-pit mine produces enough ore to supply one nuclear plant and that the pit is refilled (or otherwise stabilized) at the end of 26 yrs. of operation (see Tr. 4550), then 2,860 Ci of radon would be released per AFR, which is less than that estimated for underground mining.

99. The NRC has no regulatory authority over uranium mines; it is entirely a state matter. Therefore, we inquired concerning the present practices of the state regulatory agencies. Mr. Wilde stated that nearly every state has rather stringent reclamation laws governing open-pit

mines. Wyoming requires that the land be returned to a condition such that it can be used for an equal or higher purpose after mining than it was used for prior to mining (Tr. 4563-66).

100. Since the amount of radon expected from the mining operations is determined by the amount of reclamation to be applied to open-pit mines, some assumptions must be made as to what might occur. Although there may be some uncertainty that all mines will be reclaimed immediately on the cessation of operations, it is our judgment that reclamation will likely occur within a reasonable period of time after mining has ceased, e.g., 10 years. This would result in an upper limit of 4,000 Ci/AFR, nearly the same as that estimated for underground mining, so it would not matter whether the uranium came from underground or open-pit mines.

101. We think it appropriate for us to note at this point the Surface Mining Control and Reclamation Act of 1977, which relates to coal mining but in which the Congress found a need to regulate surface mining of minerals other than coal (30 USC 1201). Additionally, this Act states that one of its purposes is to "assure that adequate procedures are undertaken to reclaim surface areas as contemporaneously as possible with the surface coal mining operations" [30 USC 1202(e)]. We believe this law foretells a national policy which will deal with all surface mining operations. Consequently, we believe it is very unlikely that any uranium surface mines will lie unreclaimed for more than 10 years after operations cease.

102. We find that the total radon emissions resulting from mining will be about 4,100 Ci/AFR. This finding is based on the estimate of 4,060 Ci/AFR if the ore comes from an underground mine or 4,000 if it comes from a surface mine and is, of course, applicable to any proportionate combination of underground and surface-mined ore.

Radon from Milling

103. After the mining operation, uranium ore is delivered to a mill where it undergoes the various chemical processes which result in the

separation of U_3O_8 from the other materials contained in the ore (Tr. 4460-62). At the mill there are a number of potential points of radon release. One point is the stockpile where the ore awaits processing (Tr. 4464). There will be some generation of radon during this storage period. Staff witness Magno testified that this was considered in developing his estimates but proved to be only a very minor contribution requiring no separate consideration (Tr. 4512-14). During the course of milling, there will be the release of some radon as a result of crushing and grinding and various chemical processing steps. Staff witness Magno estimated that this release would amount to some 30 Ci/AFR (Magno following Tr. 4276, pp. 2 and 3). We accept this estimate. Thereafter, the tailings or residual materials remaining after the uranium has been extracted (which contain substantial amounts of thorium and radium) go to a tailings pile (Tr. 4462-64). Mr. Magno provided separate estimates for radon releases from the tailings piles during different periods during and following active milling (Magno following Tr. 4276, p. 2).

104. Mr. Magno's testimony provides an estimate of approximately 750 Ci of radon per AFR released from the tailings during the period of active mill operation, which he took to be 26 yr. (Magno following Tr. 4276, pp. 4 and 5). During this period of time, a portion of the tailings pond is composed of wet pond area, wet sandy beach areas, and some dry beach areas. Radon is released principally from the dry beach areas (id., p. 4). Mr. Magno estimated that during the following period of approximately 5 yrs. during which the tailings piles dry out and are stabilized, approximately 350 Ci/AFR would be generated (id., p. 6).

105. Mr. Magno's values of 750 and 350 Ci of radon per AFR emitted from the piles prior to stabilization were used by Gotchy (following Tr. 4280) in his estimates of health effects from milling. We adopt them as reasonable estimates.

106. Mr. Magno estimated that at the end of the 5-yr. dry out period the tailings piles would be emitting radon at a rate of about 110 Ci/yr./AFR (id., p. 10).[4]

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[4] This value is consistent with that derived in NUREG-0002, which was relied upon by Board member Jordan in questioning the 74.5 Ci that appeared in Table S-3.

107. The total amount of radon emitted per AFR depends entirely on the assumptions that are made concerning the stabilization of the tailings piles after they dry out. If the piles remain uncovered, or are protected only by a foot or two of soil, as has been the practice in the past, the radon will continue to be emitted at a rate of 110 Ci/yr./AFR for tens of thousands of years (ibid.).

108. Staff witness R. L. Gotchy (following Tr. 4280) assumed that the tailings piles would be stabilized but that erosion would decrease the effectiveness of stabilization in the future. He assumed that the tailings piles would emit radon at a rate of 1 Ci/yr./AFR for the first 100 yrs., 10 Ci/yr./AFR for the next 400 yr. and 100 Ci/yr./AFR for periods beyond 500 years (Gotchy following Tr. 4280, p. 4). Thus, at the end of 10,000 yrs., he estimated 912,000 Ci/AFR, which would amount to 7×10^7 Ci due to the 80 AFRs required for Pebble Springs (id., Table 6).

109. We question the Gotchy assumptions on stabilization. Mr. Magno testified that the Staff has recently developed performance objectives for tailings piles management that will require that the tailings piles be buried so deep that the radon emission rate will be no more than double the release rate from natural soils in the surrounding environs (Magno following Tr. 4276, p. 6). This will require some 6 to 20 ft. of soil over the piles and will reduce the rate to less than 1 Ci/yr./AFR, about 1 percent of the rate from unstabilized piles (id., pp. 7-9).

110. Since a number of mills may be located in agreement States and thus are not subject to NRC licensing, the Board questioned the asumption that all tailings piles would be subject to stabilization requirements. Mr. Magno testified that States in which uranium milling activities are carried out have indicated to the Staff their intention to impose stabilization requirements similar to those described by the Staff (Tr. 4506-07).

111. The Board is of the opinion that the situation with respect to tailings piles has changed greatly. The new NRC requirements will assure that they will no longer be a major source of radioactivity. The NRC

Staff has recognized the problem and has moved to handle it (Tr. 4501-04). Tailings piles stabilized to NRC criteria will emit only 1 Ci/yr./AFR so that the amount of radon from tailings piles associated with the fueling of the Pebble Springs Nuclear Plant will be less than 100 Ci/yr. This is negligibly small compared to the natural emission of radon from the soil of the U.S. (some 10^8 Ci/yr. - see Gotchy following Tr. 4280, p. 14).

112. We note that subsequent to Mr. Magno's testimony the 95th Congress passed the Uranium Mill Tailings Radiation Control Act of 1978 (Mill Tailings Act) and the President has signed the Act into law (Act of October 14, 1978, Pub. L. No. 95-604). The Mill Tailings Act provides, inter alia, that the NRC shall require adequate tailings management by uranium mill licensees and that agreement states shall abide by standards at least as stringent as the NRC's. We note also that the NRC has recently amended its regulations, in response to the requirements mandated in the Mill Tailings Act, to specify licensing requirements for uranium and thorium milling activities, including tailings and wastes generated from these activities (45 FR 65521). In our view this new law and concomitant Commission regulations eliminate most of the uncertainties with regard to mill tailings stabilization.

113. We find that the radon released by milling the ore for one AFR would amount to 30 Ci from the milling process, 750 Ci from tailings during the milling process, 350 Ci from tailings after cessation of active milling but prior to stabilization, and then 1 Ci/yr. thereafter from the stabilized tailings piles.

Radon and Health Effects

114. Uranium miners are exposed to air containing a considerable concentration of radon, on the order of 100 pCi/liter, but no one escapes breathing some radon (Tr. 4535). Radon seeps from the soil (because the soil contains uranium) and mixes with the air we breathe. The amount varies from place to place. It has been estimated that the average concentration of radon in the air over the continental U.S. is about 150 pCi/m^3, which in itself produces a dose to the bronchial

epithelium of about 450 mrem/yr. (Gotchy following Tr. 4280, p. 14). In addition, modern man lives in houses with concrete floors, stone fireplaces or brick walls. He works in buildings made of concrete. The radon concentration inside such homes and buildings is much larger than it is out of doors. Consequently, the average dose to an individual in the U.S. is estimated to be about 1,650 mrem/yr. (Tr. 4717-18).

115. Dr. Gotchy's estimates of health effects were based on the linear assumption using risk estimators from WASH-1400 and GESMO (Gotchy following Tr. 4280, pp. 7-9). We are of the opinion that the linear hypothesis provides a conservative estimate of potential health effects due to small doses of radiation to large populations.

116. Dr. Gotchy adopted a simple wedge model for calculating the dispersion of the radon plume from a mine or tailings piles as it moves across the U.S. He used present population density figures increased by a factor to bring the total U.S. population to 300 million. He relied on the RABGAD computer code developed for NUREG-0002 to calculate the total population doses per curie of radon emitted. Then, using the risk estimators of WASH-1400 and NUREG-0002, he estimated the maximum potential health effects for a 100 to 1,000 year period to range from 0.15 to 1.6 per AFR (Gotchy following Tr. 4280; Gotchy following Tr. 5442, Supplemental Affidavit). Thus, the total potential impact represented by Pebble Springs operation, assuming 80 AFRs, could be postulated to range from 12 to 128 health effects over 1,000 years.

117. Dr. Gotchy's testimony discusses at length the reasons for his conclusion that he cannot predict specific health effects into the future beyond 1,000 yrs. (Gotchy following Tr. 4280, pp. 11-13; Gotchy Supplemental Affidavit IV-1 - IV-20, following Tr. 5442). Dr. Gotchy further shows that on another basis one can conclude that the radon release from the nuclear fuel cycle does not have a significant adverse impact. He compared radon releases resulting from the mining and milling of uranium with radon naturally occurring on the earth and provided calculations out to 10,000 yrs. of the comparative population exposure resulting from radon emanation from the nuclear fuel cycle compared to the naturally occurring exposures. These calculations show that exposures due to radon

releases from mining and milling are insignificant compared to natural background radiation exposures (Gotchy following Tr. 4280, pp. 13-16).

118. The Board has weighed carefully the views of the Staff. While we do not dispute the factual evidence, we do question the proper treatment of projections of potential effects into a distant future. We believe that we have an obligation to assess the effects of today's actions on future generations. We certainly must consider any known effects on our immediate successors as of importance comparable to effects on those now living. When it comes to balancing adverse impacts to those descendants who may follow thousands of years from now against the benefits to the present generation, we would weight benefits to the present population. The benefits are certain - the impacts hypothetical. The action presently proposed is not one that presents a serious risk to any future generation. A potential health effect every 10 to 100 years in a population of 300 million people is a minimal impact (see Paragraph 116). Under the NRC stabilization procedures and reasonable regulations on open pit reclamation, the impact will be 100 times less (see Paragraphs 99-101, 108-112).

119. Based on the record available to this Board, we find that the best mechanism available to characterize the significance of the radon releases associated with the mining and milling of the nuclear fuel for the Pebble Springs facility is to compare such releases with those associated with natural background. The increase in background associated with Pebble Springs is so small compared with background and so small in comparison with the fluctuations in background as to be completely undetectable (see Paragraphs 111 and 117). Under such a circumstance, the impact cannot be significant.

Conclusion

120. In response to the Commission's directives contained in the statement of consideration issued in connection with the amendment to Table S-3 of 10 CFR Part 51, published in the Federal Register on April 14, 1978 (43 FR 15613), this Board has carefully considered available information

concerning the releases of Rn-222 associated with the uranium fuel cycle and health effects that can reasonably be deemed associated therewith, and concludes that such releases and impacts are insignificant in striking the cost-benefit balance for the Pebble Springs Nuclear Plant.

I. ALTERNATIVES TO THE PROPOSED PLANT (ENVIRONMENTAL EFFECTS OF THE COAL VS. NUCLEAR FUEL CYCLE)

121. In Section 9.2.2 of the FES the Staff concluded that the only viable alternative to the proposed nuclear-fueled plant at Pebble Springs would be a coal-fired unit. Comparative environmental costs of both types of plants are set forth in Table 9.4 of the FES. The Staff concluded that the overall impact on the environment of the nuclear units will at least be no worse than that expected from a comparable coal-fired station (Ex. S-1, pp. 9-10).

122. Pursuant to the Atomic Safety and Licensing Appeal Board's decision in Hartsville (ALAB-367, 5 NRC 92, January 25, 1977), the Staff presented supplemental testimony regarding the health effects attributable to coal and nuclear fuel cycle alternatives (Gotchy following Tr. 5600). In making this evaluation, Dr. R. L. Gotchy considered the entire fuel cycle associated with each alternative. The coal fuel cycle consists of mining, processing, transportation, power generation, and waste disposal. The nuclear fuel cycle includes mining, milling, uranium enrichment, fuel preparation, fuel transportation, power generation, irradiated fuel transport and reprocessing.

123. It is extremely difficult to provide precise quantitative values for excess mortality and morbidity, particularly for the coal fuel cycle. Nevertheless, the Staff made a number of estimates of mortality and morbidity based on present-day knowledge of health effects and present-day plant design and emission rates, occupational experience and other data. While future technological improvements in both fuel cycles may result in significant reductions in health effects, based on current estimates for present-day systems the Staff concluded that the nuclear fuel cycle is considerably less harmful to man than the coal fuel cycle.

As shown in Tables 1 and 2 of Dr. Gotchy's testimony (following Tr. 5600), the coal fuel cycle alternative may be more harmful to man by factors of 7 to 42, depending on the effect being considered, for an all-nuclear economy, or factors of 6 to 14 with the assumption that all of the electricity used . the uranium fuel cycle comes from coal-powered plants. These comparisons include the revised estimates for Rn-222 releases from mining and milling operations.

124. We note that although there are large uncertainties in the estimates of most of the potential health effects of the coal cycle, the impact of transportation of coal is based on firm statistics; this impact alone is comparable to the conservative estimates of health effects for the entire uranium fuel cycle (all-nuclear economy) and can reasonably be expected to worsen as more coal is shipped over greater distances. In the case where coal-generated electricity is used in the nuclear fuel cyc e, primarily for uranium enrichment and auxiliary reactor systems, the impact of the coal power accounts for essentially all of the impact of the uranium fuel cycle (Gotchy following Tr. 5600, p. 11).

125. The Board finds that the environmental impact of the proposed nuclear plant, including health effects, is less than the environmental impact of the coal-fired plant and, in this regard, is the more desirable alternative.

I. ALTERNATIVE SITES

126. The matter of alternative sites was considered in the Applicant's ER and the Staff's FES and previously during this proceeding (Tr. 3115, 3177-82, 3185-3205, 3262-3300). On August 2, 1978, the Staff filed a motion for leave to supplement the record as to alternative sites. No replies to this motion were received from any of the other parties to this proceeding. On August 17, 1978 this Board issued an order approving the Staff's motion subject to the understanding that the Staff would conduct this analysis as expeditiously as possible. The Staff subsequently completed their review which was issued as Supplement No. 1 to the Final Environmental Statement. (45 FR 26855, April 21, 1980). This matter will be taken up in a future hearing.

K. PLANT DESIGN ALTERNATIVES

127. In order to minimize the environmental impact of Pebble Springs, both Staff and Applicant have evaluated alternatives to various plant systems, considering economic costs and operational aspects as well as environmental impacts. Several methods of waste heat dissipation were considered. The Applicant concluded that no alternative system had a clear environmental advantage and that the cooling reservoir should be selected on an economic basis. (Ex. A-2, Section 10.1) The Staff concluded that once-through-cooling, mechanical-draft towers and natural-draft towers were viable alternatives but that the selected cooling reservoir was a reasonable choice. (Ex. 5-1, p. 9-18) The Board agrees.

128. Various other alternate plant systems, such as the intake system, discharge system, chemical waste treatment, biocide treatment, sanitary waste treatment, radioactive waste treatment and transmission line routes were considered. None of these evaluations reflected economic or environmental advantages that would warrant their selection instead of the systems proposed. (Ex. A-2, Section 10; Ex. 5-1, Section 9.3) The Board agrees with this conclusion.

III. FINDINGS OF FACT - SITE SUITABILITY

129. The Board has reviewed the site proposed for the Pebble Springs Nuclear Plant to determine whether, based upon the available information and review to date, there is reasonable assurance that the proposed site is a suitable location for nuclear power reactors of the size and type proposed by the Applicant from the standpoint of radiological health and safety considerations under the Atomic Energy Act and rules and regulations promulgated by the Commission pursuant thereto.

130. Our review was based upon the evidence set forth in the record including the Staff's Site Suitability Report (SSR) which appears following Tr. 269 and the Staff's Safety Evaluation Report (SER), including Supplements 1 through 5 inclusive (Exs. S-13, S-14, S-15, S-16, S-17 and S-18). Supporting information, which we examined, included the Applicant's Preliminary Safety Analysis Report (PSAR), the Applicant's Environmental Report (ER), the Staff's Final Environmental Statement (FES), and the transcripts of the hearing (Exs. A-1, A-2, S-1 and S-2). The Board's review has been guided by the Reactor Site Criteria given in the Commission's regulations on site suitability as related to radiological health and safety (10 CFR Part 100). The factors considered are the population density and land use characteristics of the site environs; the potential influence of nearby industrial, military and transportation facilities; and the physical characteristics of the site, including its meteorological, hydrological, geological and seismological characteristics.

131. The facility will be located 3 miles southeast of the town of Arlington, in the northeast corner of Gilliam County, Oregon, about 3 miles southeast of the Columbia River and 160 miles east of the City of Portland. The site is an irregularly shaped 8650-acre tract of land. The facility will consist of two pressurized water reactors. Each unit is designed for a rated core thermal output of 3,600 MW and net electrical output of about 1,260 MW. The site evaluation has been conducted for an ultimate core thermal power of 3,760 MW. The nuclear steam supply systems will be purchased from the Babcock & Wilcox Company and the turbine generators will be purchased from the General Electric Company.

Bechtel Power Corporation is the architect-engineer for the Plant (Ex. S-2, p. 2; Ex. S-13, p. 2-1).

A. POPULATION DENSITY AND USE CHARACTERISTICS

132. The exclusion area is an area based on a radius of 800 meters (0.5 miles) from the centers of each reactor in Units 1 and 2. Part of the exclusion area is occupied by the proposed man-made cooling reservoir. There are no public roads, railroads or waterways which traverse the exclusion area. There are no plans for a visitors information center at the proposed site. The Applicant owns all the land, including mineral rights, within the exclusion area and has the authority to determine all activities within this area as required by 10 CFR Part 100.3(e) (Ex. S-2, p. 3; Ex. S-13, p. 2-1; Ex. S-14, p. 2).

133. The Applicant has selected a low population zone (LPZ) radius of 2 miles from the center of the facility. In 1970, nine persons resided within the LPZ, the nearest residents being located about 1.5 miles west of the site. There is no significant transient population within the LPZ. The largest community within 10 miles of the site is Arlington, located 3 miles to the northwest, which had a 1970 population of 375 persons. The nearest population center, as defined in 10 CFR Part 100, of 25,000 persons or more is the tri-cities of Richland, Pasco and Kennewick, Washington, located 55 miles northeast of the site. This population center had a combined 1970 population of about 55,000 residents. The population center distance is at least 1-1/3 times the LPZ distance (Ex. S-2, p. 4; Ex. S-13, pp. 2-1 and 2-5).

134. The 1970 population estimates for the area within a 50-mile radius of the site is about 70,000. The Applicant projects this to increase to about 91,000 by the year 2020. The Applicant's projected population increase is equivalent to an average of about 6.7 percent per decade and compares with a projection of about 7.2 percent per decade made by the U. S. Department of Commerce. By the year 2020, the population density will be substantially less than 500 persons per square mile at all distances out to 50 miles (Ex. S-13, pp. 2-1, 2-4 and 2-5).

135. The 1970 population density within 10 miles of the site was less than 2 people per square mile and is predicted to increase to 2.2 persons per square mile for the year 2020. Within 30 miles of the site, the 1970 population density was about 1.5 people per square mile and is projected to increase to 2.5 people per square mile by the year 2020. Since the nearest large city is more than 30 miles away, no special consideration contemplated by 10 CFR Part 100.11(a)(3) need be given to distance from the population center (Ex. S-2, p. 4).

136. The Board concludes that the specified exclusion area radius, low population zone outer boundary, and population center distances meet the guidelines of 10 CFR Part 100 and are acceptable (Ex. S-13, p. 2-5).

B. NEARBY INDUSTRIAL TRANSPORTATION AND MILITARY FACILITIES

137. No nearby industrial, transportation or military facilities have been identified for which the facility could not be designed against, as necessary, to protect the health and safety of the public. The nearest public road is Rhea Road passing approximately 0.6 miles north of the facility (Ex. S-2, p. 4).

138. Other nearby transportation facilities are State Highway 19 and a spur line of the Union Pacific Railroad, both running parallel to one another and located about 1.5 miles southwest of the facility. Other major nearby transportation routes include Interstate Highway I-80N, the main line of the Union Pacific Railroad and the Columbia River, all located about 3 miles northwest of the site where they also run parallel to each other. The Staff has evaluated the effect upon the Plant of postulated explosions of the probable maximum cargo of high explosives in either a truck or a railroad boxcar, located at their closest points of approach. The resulting peak overpressures were found to be much lower than those produced by the design basis tornado. We therefore agree with the Staff's conclusion that these potential hazards need not be considered in the design of the proposed facility (Ex. S-13, pp. 2-5 and 2-6).

139. In the SER (Ex. S-13), the Staff identified a potential hazard due to the shipment to other industrial customers, significant quantities of chlorine and anhydrous ammonia on the Union Pacific Railroad about 3-1/2 miles away from the site, which might affect personnel at the Plant. The Applicant has agreed to install non-Seismic Category I ammonia and chlorine detectors to monitor the air supply to the control room. Seismic Category I detectors would be required if significant quantities of chlorine were stored in the vicinity of the site. However, since these chemicals will not be stored at the site and since they will be on the rail line for a short time, the Staff concluded that non-Seismic Category I detectors are acceptable. Also, the distance between the site and the railroad (3.3 miles minimum), as well as the fact that the site is over 350 ft. higher in elevation than the railroad, are factors that would significantly mitigate any consequences of a toxic gas release (Ex. S-14, p. 3). The Board therefore concludes that the installation of non-Seismic Category I ammonia and chlorine detectors is appropriate and acceptable.

140. The only airport within 10 miles is located 2 miles northeast of the site. This field serves only light planes and has less than one landing per day. The single gravel runway is aligned in an east-west direction so that landings and takeoffs are not in the direction of the facility. The closest airport with regularly scheduled commercial service is at Pasco, Washington, about 55 miles northeast of the site. Two commercial airways pass through the site vicinity. Airway J-16, a high altitude airway where flights are restricted to above 24,000 ft. altitude, passes directly over the site; while airway V-112, a low altitude route, passes more than 10 miles south of the facility. Because of the high altitude of aircraft crossing this site on Airway J-16 and the distance of Airway V-112, the Board concludes that the hazards from flights on these airways is that associated with general over flights only. The Board further concludes that these potential hazard sources need not be considered in the design of the facility (Ex. S-2, p. 5; Ex. S-13, P. 2-6).

141. There are no military bases within 5 miles of the site. The nearest base is the U. S. Navy Weapons System Training Facility (WSTF) located about 20 miles east of the site. The U. S. Army Umatilla Depot is located about 30 miles to the east. Activities at the WSTF involve training of U. S. Navy pilots based at Whidbey Island Washington, in weapons delivery techniques employing 25 pound inert devices.

142. The State of Oregon provided testimony regarding the approach patterns used at the WSTF (Ex. O-2, Attachment 2; Tr. 518-21). The Applicants accepted a proposed State Site Certificate condition as follows:

> "If the Navy still operates the WSTF, no construction shall commence on any nuclear-fueled plant at the Pebble Springs site until the Council has been presented with evidence satisfactory to it that the following actions will be completed prior to the plant fuel-loading date.
>
> (a) The WSTF west corridor has been rotated at least 10 degrees clockwise.
>
> (b) Modifications have been made to aircraft checkpoints and other WSTF operational procedures to ensure that aircraft using the WSTF do not pass within 5 miles of the Pebble Springs nuclear-fueled plants, and do not fly directly toward the plants while approaching the west corridor.
>
> No nuclear plant shall be fueled or operated until the U. S. Navy has made the above changes to the WSTF operation."

143. In response to these statements by the State of Oregon relating to the requirements of their proposed Site Certificate for the Pebble Springs project, the Board inquired of Applicant as to the Department of the Navy's position regarding rotation of the Navy's present west corridor avigation easement at the Naval Air Station, Whidbey Island (Weapons

System Trailing Facility, Boardman, Oregon) at least 10 degrees clockwise (Tr. 2330). The Applicant testified and provided for the Board's consideration a letter from the Department of Navy dated January 21, 1975 which indicated the Navy's agreement to rotate the west corridor avigation agreement (Hastings following Tr. 2841). The Board concludes, on the basis of distance from the proposed site, and the nature of the approach, departure and operational flight patterns at the WSTF, that these activities are not of such a nature as to preclude site suitability.

144. There are no oil or gas pipelines within 5 miles of the site. Two petroleum products storage facilities are located 2 miles west of the site. Up to 130,000 gallons of gasoline may be stored there. Based upon the distances to these storage facilities and the quantities of materials stored there, the Board concludes that the effects of accidents there need not be considered in the design of this facility (Ex. S-2, p. 6; Ex. S-13, p. 2-7).

145. On the basis of the above considerations, the Board concludes that there are no nearby activities which would preclude site acceptability.

C. METEOROLOGY

146. The site for this facility is in a region where atmospheric dispersion conditions are about average for the western United States (Ex. S-2, p. 6).

147. A description of meteorological conditions at the site, including the climatology of the region, local meteorological conditions and expected severe weather, is presented in Section 2.3 of the Staff's Safety Evaluation Report (Ex. S-13).

148. The tornado used for the facility design (240 miles/hr. maximum wind speed) is sufficient for the area of the country in which the site is located. The design basis, sustained (fastest mile) wind speed of 100 miles/hr. at a height of 30 ft. with a return period of 100 yr. is also acceptable for the site (Ex. S-13, p. 2-8).

149. The Applicant has provided a 1-yr. period (1/74-12/74) of onsite joint frequency distributions of wind speed and direction at the 30-ft. level by atmospheric stability (defined by the vertical temperature gradient between 30 ft. and 130 ft.). The meteorological system conforms to the recommendations of Regulatory Guide 1.23 (Ex. S-13, p. 2-9).

150. Data on dust and sand storms at the site are very limited. The Applicant has supplemented this data with information concerning the probable distribution of particulate mass and size loadings with height, based on studies at Hanford, Washington. The Applicant is establishing a sampling program at the nearby Boardman site (20 miles east of Pebble Springs) to verify the applicability of the Hanford studies (Ex. S-13, p. 2-9).

151. An evaluation of short-term accidental releases from buildings and vents, assuming a ground-level release with a building wake factor, cA, of 1365 m^2, was made by the Staff using the onsite data and the diffusion model as described in Regulatory Guide 1.4, but with modifications for desert climates. The modified model includes the effects of plume meander and decreased vertical dispersion encountered in such regions by incorporating lateral and vertical dispersion parameters (sigma-y and sigma-z) which are based on diffusion data developed at the National Reactor Testing Station. A comparison of the short-term (0-2 hr) relative concentration (χ/Q) value estimated for the Pebble Springs site with similar values calculated by the NRC Staff for over 40 other sites indicates that the dispersion conditions at Pebble Springs are better than at 85 percent of the other sites (Ex. S-2, p. 7).

152. Estimates of average atmospheric diffusion conditions have been made by the Staff from the Applicant's meteorological data and appropriate diffusion models as described in Regulatory Guide 1.111. The highest offsite annual average relative concentration of 1.3×10^{-6} sec/m^3 for vent releases occurs at the site boundary west of the proposed facility (Ex. S-13, p. 2-10; Ex. S-16, pp. 2-1 and 2-2).

153. The Board concludes that there are no meteorological characteristics that would preclude site acceptability.

D. HYDROLOGY

154. The site is located in a semi-arid area of north-central Oregon, approximately 3 miles southeast of Arlington, Oregon, and the Columbia River and about 150 miles east of Portland, Oregon. The plateau separates Alkali and Eightmile Canyons, and lies approximately 400 ft. above the estimated probable maximum flood level of the Columbia River. Eightmile Canyon flows into Willow Creek, about 3 miles east of the site, thence to the Columbia River, while Alkali Canyon is a direct tributary of the Columbia River (Ex. S-13, p. 2-11).

155. The facility will be located adjacent to Pebble Springs reservoir, which will be constructed and used for evaporative cooling and for irrigation. The reservoir will be formed by two dams at each end of a natural topographic saddle. The Columbia River is the source of makeup water and a means of discharging reservoir water via Eightmile Canyon. A Category I spray pond is provided for each generating unit as an Ultimate Heat Sink (UHS) for emergency cooling. Plant grade is 740 ft. mean sea level (MSL), normal finish grade around the Plant is 0.5 ft. lower with a slope to provide rainfall runoff through open drainage ditches and gutters to the reservoir. Normal water surface elevation for the reservoir will be Elevation 720 ft. MSL. A combined spillway and outlet works tower structure will be located on the north abutment of the east dam. Three sides of the tower have a free overflow spillway at Elevation 720.5 ft. MSL. The drainage area of the Columbia River at Arlington is estimated to be about 220,000 square miles. The average annual historical discharge of the Columbia River at this point is about 188,000 cubic feet per second (cfs) (Ex. S-13, p. 2-11).

156. The watershed draining into the proposed Pebble Springs reservoir is 6.1 square miles. Average rainfall for the area is approximately 9 in. per year with more than 50 percent occurring in the 4-month period November to February, and approximately 7.5 percent occurring in July to September. Thus, only after some winter rains or intense summer thunderstorms is there any appreciable runoff in the basin. There are no surface water users in the vicinity of the site, although the city of

Arlington (3 miles northwest of the site) has received a permit from the State Engineer to withdraw 8.16 cfs from the Columbia River for municipal use (Ex. S-13, p. 2-11).

157. The potential for flooding of the site from several sources has been investigated by the Applicant and independently by the Staff. The site is subject to flooding only from local intense precipitation in the area adjacent to the site. There are no records of flood flows in either Eightmile Canyon or Alkali Canyon. Records of similar basins in the area show that the site could be subject to rare precipitation. All safety-related components of the facility are set at an elevation higher than the maximum level determined from the probable maximum precipitation (PMP) with attendant wind generated waves. The facility will be approximately 300 ft. above the river level at the Hanford Reservation estimated from the worst sequential failure of the dams on the Columbia River considered reasonably possible by the Staff. Failure of Pebble Springs reservoir, which will be at a lower level than safety-related facilities, would not endanger the facility. Safety-related Seismic Category I spray ponds are to be excavated in natural ground below Plant grade and therefore pose no danger to the facility. (Ex. S-13, pp. 2-11 to 2-14).

158. Makeup water for the Service Water System will be pumped from the Columbia River into Pebble Springs reservoir. The Plant makeup water system, including the Columbia River and Pebble Springs reservoir, is not safety-related. The Ultimate Heat Sink for the facility consists of two Seismic Category I spray ponds with sufficient capacity and redundancy to guarantee a 30-day supply of water. (Ex. S-13, pp. 2-13 and 2-14).

159. Water from the Columbia River or from Pebble Springs reservoir is the normal water supply source of the service water system. The Columbia River, even under extreme drought conditions, is capable of supplying the relatively small amount of required makeup water. The facility safety-related cooling water flow contained in the two spray ponds is independent of the normal water supply. The Staff assumed the UHS would be independent of these sources in the event of an accident or a required shutdown. In the unlikely event that water could no longer

be pumped from the Columbia River and the water supply from the Pebble Springs reservoir were no longer available, the UHS would provide the water for emergency shutdown. (Ex. S-13, p. 2-13). We concur with the Staff's conclusion.

160. There will be no operational or normal releases of liquid effluents to the Columbia River. Routine releases will be monitored and made to the Pebble Springs reservoir. Reservoir releases for irrigation will also be monitored and will meet the applicable criteria (Ex. S-13, p. 2-13).

161. Groundwater in the region is present under both confined and unconfined conditions. All significant groundwater used in the area is from these regional aquifers. Water from these regional aquifers will be used only during construction of the facility. Because of the presence of dense, impermeable basalt flows in the area, the proposed Pebble Springs reservoir should have no effect on the regional aquifers. The reservoir will, however, create a "groundwater mound" in the immediate vicinity of the facility. The Staff believes this will likely result in numerous springs in the area as the water, unable to penetrate the dense basalt flows, travels along the fractured and weathered surface of the rock. The springs likely to develop to the northwest of the facility will be located on the side of canyon tributary to Alkali Canyon about 1,000 ft. from the site, and will be the nearest downgradient source of water available for use from water flowing under Plant structures (Ex. S-13, pp. 2-13 and 2-14).

162. The Staff determined the contamination of this water that could be caused by a postulated radioactive spill, after which limited groundwater dilution and travel time would be available, could be expected to produce concentrations above allowable limits. The Applicant has agreed to incorporate into Plant design certain measures, including a watertight steel liner in the radwaste receiver tank compartment, to mitigate the consequences of postulated component failures involving contaminated liquids. (Ex. S-13, p. 2-14; Ex. S-14, pp. 19 to 21). The Board finds this acceptable.

163. The Board concludes that the site safety-related facilities are not susceptible to flooding from any source and that an adequate safety-related water supply will be provided that does not require unique design requirements, based upon similar facilities that have been proposed and found acceptable. Furthermore, the Board concludes that the provisions to be incorporated in Plant design to mitigate the consequences of postulated liquid radwaste spills are acceptable.

E. FOUNDATION ENGINEERING

164. Except for a mantle of near-surface soil materials, subsurface rock conditions are relatively uniform in the vicinity of the Plant site. The soils are underlain by at least 2000 ft. of crystalline basalt flows interbedded with hard, dense, tuffaceous and sedimentary materials. The significant stratigraphic units from the ground surface to depth respectively, are a thin surficial deposit, the Dalles Formation, the Rattlesnake Ridge member, the Pomona flow, and the Selah member (Ex. S-13, p. 2-20).

165. Surficial deposits of alluvial and eolian materials are present in the site area and occur as thin scattered deposits. The Dalles formation is less than 20 ft. thick and consists of a dense to very dense sandy gravel and sandy silt. The Rattlesnake Ridge member is a hard, clayey, sandy, silt, about 25 ft. thick (Ex. S-13, p. 2-20).

166. Glaciofluvial erosional events have altered the thickness of the Dalles formation and the Rattlesnake Ridge members. The Pomona basalt flow is a hard to very hard basalt and is about 60 ft. thick. The upper 5 to 15 ft. is composed of a breccia and vesicular zone. The lower zone is a dense massive basalt (Ex. S-13, p. 2-20).

167. The Pomona flow basalt located at a depth of about 50 ft. will be the main bearing formation. This dense basalt has high compressive strength and a shear wave velocity which is at least 6,000 fps. Core recovery in this formation was usually nearly 100 percent. The rock quality designations were generally about 90 percent. The Selah member

is about 300 ft. thick and is composed of hard clayey silt (Ex. S-13, p. 2-20).

168. The soils have the Pomona basalt very considerably due to the irregular erosion and deposition of these materials. Review by the Staff's consultant, The Corps of Engineers, indicated that these materials should be removed during excavation and concrete backfill should be provided from the top of the rock to the foundation level for structural support. The Applicant has proposed to excavate the soils above the Pomona flow basalt and provide select, well graded, well compacted sandy gravel and concrete for structural fill to support foundations. Backfill materials will be sandy gravels placed in thin lifts and compacted to a high density. The Staff found the Applicant's proposal to be acceptable (Ex. S-13, p. 2-20). We concur.

169. Static foundation loading varies from 2.2 to 9.4 kips per square foot for Seismic Category I foundations. Bearing capacity factors of safety greater than 3 will be provided for all static conditions. Bearing loads are controlled by allowable settlement. The maximum estimated settlement and differential settlement occur under the Fuel Building and are 1.2 and 0.9 in., respectively. The Containment and Auxiliary Buildings will be founded on Pomona basalt so settlement of these structures will be negligible (Ex. S-13, p. 2-20).

170. The present groundwater level is below the proposed foundation grades. The Pebble Springs reservoir will raise the groundwater level. The design groundwater level for the facility is based on the higher groundwater level (Ex. S-13, p. 2-21).

171. In the upper breccia zone of the Pomona basalt, permeability is high due to fist-size voids. A reservoir grouting program and a spray pond liner are to be used to prevent leakage from the reservoir and spray pond (Ex. S-13, p. 2-21).

172. The Applicant reports that a few discontinuous find sand, silty fine sand and find sandy silt lenses or pockets are scattered throughout

the Dalles Formation and the Rattlesnake Ridge member. Most standard penetrations tests in these materials indicate that their relative densities are about 80 percent. The Applicant has evaluated the liquefaction potential of these pockets and lenses under a SSE of 0.2g and concludes that they will not be subject to liquefaction. (Ex. S-13, p. 2-21). We agree with that conclusion.

173. Static and dynamic analyses were performed by the Staff and Applicant on earth slopes which could potentially affect the safe operation of the proposed power plant. Natural slopes adjacent to the facility are relatively flat and have adequate factors of safety. The Applicant evaluated the stability of Alkali Canyon during steady seepage and dynamic earthquake conditions. The results show that some minor sloughing of colluvium may occur along the sides of Alkali Canyon, but the site will not be affected. The Staff and their consultant, the Corps of Engineers, have reviewed this evaluation and agree with the Applicant's conclusion (Ex. S-13, p. 2-21). We also concur.

174. The Applicant has evaluated the stability of safety-related slopes for the spray ponds, intake channel and a site excavation slope north of the Plant site. All these slopes have been evaluated for both static and dynamic conditions. The Staff concluded that the selection of soil strength properties for use in the analyses is acceptable and the computed factors of safety are satisfactory. The cut slopes must be inspected during construction to verify the material profile assumed for the stability analysis (Ex. S-13, p. 2-21). We agree with the Staff's conclusions.

175. In their status review of March 21, 1975, the USCG asked if the elevated local groundwater level, due to the presence of the reservoir, could cause excessive seepage leading to progressive slope failure within the Selah member that might eventually undermine the site and the west earthern dam. On June 25 and 26, 1975, the USGS examined these slopes. It is the Staff's opinion that the facility and west dam are sufficiently remote from the slope that there is no hazard to the facility in the near future. However, to insure that a potential hazard does not develop,

the Staff will require that the Applicant carry out an instrumentation and monitoring program. The Applicant had already planned to closely monitor groundwater conditions. In addition to groundwater observation wells, the Applicant has committed to install instruments to detect land movement (Ex. S-13, p. 2-18). We find this commitment acceptable.

176. Based on the record herein, the Board concludes that there are no foundation engineering considerations that would preclude the acceptability of the site.

F. GEOLOGY

177. The site is located near the center of the Columbia Plateaus physiographic province (Fenneman, 1946). The province is bounded on the north and east by the Northern Rock Mountains, which consist of Mesozoic and Paleozoic metamorphic rocks and granitic intrusives, on the south of the Basin and Range, and the Sierra Cascade complex to the west (Ex. S-13, p. 2-15).

178. Structurally, the site is located in the Columbia Plateaus province (King, 1969). The Columbia Basin is underlain by Late Tertiary (mostly Miocene) Columbia River basalt and interbeds, which attains thickness greater than 5000 ft. in the Pasco and Yakima Basins. The basalts in most of the basin probably directly overlie a granitic and metamorphic basement, while in the site area they probably directly overlie the Tertiary John Day and Clarno formations which in turn overlie pre-Tertiary rocks as exposed in the Blue Mountains to the south. The site is located on the south flank of one of the major downwarps within the Columbia Basin, the Dalles-Umatilla Syncline (Ex. S-13, p. 2-15).

179. The site is on the nearly flat south flank of the Dalles-Umatilla syncline. The very steep north flank rises to the north of the Columbia River to form the Columbia Hills Anticline. Farther north is the much larger and also east-west trending Horse Heaven Hills Anticline. The syncline rises gently to form the Blue Mountains Anticline to the south. The most significant major structure to be considered

in determining the SSE is the Rattlesnake-Wallula Lineament, located 55 miles northeast of the site at its closest approach. This topographic lineament trends northwest-southeast and is about 80 miles long. The lineament is a belt of en-chelon, doubly plunging anticlines comprising the Rattlesnake Hills anticline to the west and the Wallula Gap fault zone to the east. Faulting associated with the Rattlesnake-Wallula lineament, and other mapped faults in the region, appear to be related to near surface folding that occurred contemporaneously with the down-warping of the Columbia River Plateau. Thus, this structure is not likely to be directly related to basement structure nor is it likely to be continuously faulted along its entire length (Ex. S-13, p. 2-15).

180. The Columbia Hills Anticline is the closest major structure to the site. It is a 100-mile long east-west trending structure consisting of a series of discontinuous anticlines. Several short fault segments have been mapped on the steep south side of the anticline. These faults were formed during folding. By using paleomagnetic and K-Ar dating techniques, the Applicant has determined that the underformed Simcoe Lavas are at least 7 million years old. Because this formation overlies the Columbia Hills Anticline and the northern projection of the NW-SE trending Goldendale, Warwick and Laurel faults, the tectonic deformation that formed these features have occurred more than 0.7 million years ago (Ex. S-13, pp. 2-15 and 2-16).

181. Several minor northwest-southeast trending structures, mostly anticlines, are present within the region. The nearest and most significant is the Arlington-Shutler Butte lineament, which is a 40-mile long belt of discontinuous anticlines ranging from 50 to 350 ft. high. A 5-1/2 mile long fault with about 50 ft. of vertical displacement observed at its outcrop on the Columbia River is present on the east foot of one of the anticlinal ridges. The Applicant has postulated that the fault could be an additional 3.3 miles long beneath slide debris for a total length of 8.8 miles (Ex. S-13, p. 2-16).

182. The site is located in a shallow east-west upland scabland channel at elevations from 660 to 700. The channel is 150 ft. below

the general upland surface and about 170 ft. above the bottom of China Creek - Alkali Canyon to the west and 240 ft. above the bottom of Eight Mile Creek Valley to the east. Shutler Butte (part of the Arlington-Shutler Butte lineament) rises 500 ft. above the channel floor (Ex. S-13, p. 2-16).

183. The site is underlain by an estimated 2000 to 3000 ft. of Columbia River basalts and sedimentary interbeds. Only the upper flows are known to contain sedimentary interbeds. The Selah (lower) member of the Ellensburg formation is one such interbed. It overlies the Priest Rapids Basalts and is a little more than 300 ft. thick beneath the site. The top of the Selah is generally about 105 ft. deep (647 ft. elevation). It consists of poorly indurated tuff intermixed with fine silty sand (Ex. S-13, p. 2-16).

184. The Pomona basalt flow overlies the Selah. The Pomona is about 70 ft. thick beneath the site and lies at a depth of 52 ft. Three distinct zones divide the Pomona: (1) an upper 10 to 38 ft.-thick breccia (pieces of vesicular basalt intermixed with clay); (2) a middle vesicular zone which varies from a fraction of an inch to 16 ft. thick; and (3) a massive fine grained basalt zone, which ranges in thickness from 51 to 62 ft. (Ex. S-13, p. 2-16).

185. Overlying the Pomona is the Rattlesnake Ridge member of the Ellensberg formation. Its thickness varies from a few feet to 25 ft. under the site. It is a weathered tuff with a few thin layers of silt and clay. It is a poorly indurated tuffaceous silt with scattered clay or sandy silt lenses, and containes seams and pockets of caliche (Ex. S-13, p. 2-16).

186. The Rattlesnake Ridge is capped by the Pliocene Dalles formation, which consists of poorly indurated siltstone, sandstone and tuff with layers of gravel. The Dalles ranges from less than 1 ft.-thick to many tens of feet thick at the site (Ex. S-13, p. 2-16).

187. Glacio-fluvial deposits are extensive in the area but have been mostly eroded from the scabland channel within which the site is located. The remnants of glacial fluvial materials consists of sands and gravels. Locally, up to 15 ft. of windblown sand overlay portions of the site (Ex. S-13, p. 2-17).

188. Category I foundations will be placed within the vesicular or massive zones within the Pomona basalt. The Pomona is of high quality and will make a suitable foundation (Ex. S-13, p. 2-17).

189. The Board concludes that there are no geological structures in the immediate site vicinity that would tend to localize earthquake activity or cause surface faulting at the site.

G. VOLCANOLOGY

190. The nearest volcano to the site is Mt. Adams, 75 miles to the northwest. Mt. Hood is located 80 miles west of the site. The Staff considers the site to be sufficiently remote from volcanoes to preclude this being a hazard from all volcanic effects except ashfall (Ex. S-13, p. 2-16).

191. The Applicant evaluated the potential ashfall at the site and developed other necessary data for design purposes. The results of this effort are reported in "Potential for Volcanic Ash Fall at Pebble Springs Nuclear Plant Site" (Revision 1, May 17, 1976). Based on their own review and that of the U. S. Geological Survey, the Staff developed the following conditions for designing the Plant (Ex. S-16, p. 2-3):

(1) Grain size distribution of the volcanic ash at the site shall be modeled in accordance with the data in Figure 10 of the Volcanic Hazards Study report.

(2) Rate of ashfall shall be modeled generally in accordance with the 1912 Katmai eruption, assuming a maximum rate of

0.5 in. per hour for 9 hr., and a total accumulation of 8.5 in. of fresh loose ash.

(3) Acidity (pH) of the Ultimate Heat Sink and reservoir water is to be determined by using the 8.5 in. of accumulated ash in conjunction with Figure 11 of the Volcanic Ash Fall Report. Further information will be needed in the FSAR to justify the use of the buffered curves for determining the pH in the heat sink and reservoir water.

(4) Steps must be taken to minimize the drift of volcanic ash. Drifting of volcanic ashfall at the site may occur from high winds during and after the postulated volcanic eruption. Consequently, steps must be taken to protect safety-related equipment and structures from this possibility. The Applicant is required to factor this matter into the Plant design and to develop a contingency plan for mitigating the consequences of drifting volcanic ash.

We find that the above conditions will provide a conservative basis for designing a plant at the Pebble Springs site for volcanic ashfall.

192. The Board concludes that there are no volcanological characteristics that would preclude site acceptability.

H. SEISMOLOGY

193. The historical seismicity indicates that the Columbia Basin tectonic province is characterized by the infrequent occurrence of low to moderate intensity earthquakes. The largest event had a maximum intensity of VII and occurred in the Milton-Freewater area of northern Oregon in 1936. Several smaller events are also geographically clustered in the same area about 85 miles from the site. A second cluster near Ellensburg, Washington, consists only of smaller events. The remaining earthquakes are geographically scattered through the province, the largest being an intensity of VI-VII event which occurred near Umatilla,

Oregon, in 1893. It is possible that similar earthquakes could occur elsewhere in the province (Ex. S-13, p. 2-18).

194. The nearest mapped fault to the site is exposed about 5 miles west of the site along I-80N on the south bank of the Columbia River. Here it is a normal fault with about 50 ft. of down-to-the-east displacement. The fault can only be mapped for 1 mile along the east foot of an anticlinal ridge of the Arlington-Shutler Butte lineament. From this point southward, it is covered by landslide debris. A projection of the fault to the south would pass about 2-1/2 miles west of the site. Approximately 8.8 miles southward from its outcrop on I-80N, an apparently continuous outcrop of Pomona basalt crosses the fault's projection indicating that the fault has likely terminated north of this point. The Staff and USGS examined the fault exposures and the continuous Pomona basalt flow on June 25, 1975. It did not appear that the fault continued to the Pomona outcrop within the section examined (Ex. S-13, pp. 2-17 and 2-18).

195. The investigations performed by the Applicant included a large trench excavated in a north-south direction across the proposed Units 1 and 2 Containment foundations. The Staff examined the trench on June 25 and 26, 1975. The geology exposed by the trench was remarkably similar to that interpreted from the borings and seismic surveying. There were no faults in the strata exposed by the trench. Several small clastic dikes were apparent but did not extend to the base of the Rattlesnake Ridge member of the Ellensburg formation, indicating that they are not near surface manifestations of faults at depth. Additionally, they do not offset the strata through which they pass (Ex. S-13, p. 2-17).

196. We agree with the Staff's conclusion that there are no faults in the immediate site vicinity that could cause surface displacement at the site. (Ex. S-13, p. 2-18).

197. In the SER published in January 1976 (Ex. S-13) the Staff concluded that (1) the maximum random earthquake in the site region would not cause an intensity greater than Intensity VII on the Modified Mercalli

scale and could result in that intensity at the site, and (2) the Rattlesnake-Wallula lineament (55 miles from the site) represents the most significant seismically active structure which has the potential of generating a Modified Mercalli Intensity VIII. Since the publication of the SER, the Staff reviewed extensive additional information concerning the regional tectonic setting of the Pebble Springs site. The additional investigations were initiated because of the acquisition of data which resulted in relocation of the December 14, 1872 earthquake to the area of Lake Chelan, Washington. The earthquake had previously been located by Milne (1956) in southern Canada. Previously uncatalogued information on the distribution of damaging intensities caused by the 1872 earthquake came to the attention of the Staff on docketing of the Skagit Nuclear Project, Units 1 and 2 (Docket Nos. 50-522/523) Preliminary Safety Analysis Report in August 1974. During the preparation of the site investigations for the Puget Sound Power and Light Company's Skagit Nuclear Project site, an investigation of the effects of this earthquake in the United States was conducted by the Bechtel Corporation, geotechnical consultant to the Puget Sound Power and Light Company. The results were presented to the NRC in Appendix 2J of the Preliminary Safety Analysis Report for the Skagit Nuclear Project (Ex. S-17, p. 2-1).

198. Subsequently, the total available information on the intensity effects of this earthquake was evaluated by a Northwest Utilities Task Group. Their report was submitted to the NRC on December 22, 1976. The Staff requested that the USGS reevaluate the site and location of this earthquake based on the total available data, including that obtained during their review of the Skagit Nuclear Project and that developed by the Northwest Utilities Task Group. A joint USGS/National Oceanic and Atmospheric Administration panel was formed to review the relevant data. The panel concluded that: (1) the maximum intensity of the earthquake should be a Modified Mercalli IX, and (2) the epicenter could not be accurately located. The data appear, however, to require a location within a region that lies approximately between Entiat, Washington, and Chilliwack, British Columbia, as defined by the Northwest Utilities Task Group (Ex. S-17, p. 2-2).

199. In October 1977, in response to Staff questions, the Washington Public Power Supply System submitted a detailed report of extensive geological and seismological investigation of a region between 118 degrees and 122 degrees west longitude and 45 degrees and 50 degrees north latitude. This area includes parts of the Northern Cascades, Central Cascades, Okanogan Highlands and Columbia Plateau physiographic provinces and the general area of the locations postulated by Milne (1956) and the Northwest Utilities Task Group for the 1872 earthquake. The additional investigations were initiated: (1) to better define the location of the December 14, 1872 earthquake by either identifying the source structure or associating it to a geologic province; and (2) to evaluate the possibility of a similar earthquake occurring in the Columbia Plateau. To accomplish this, Washington Public Power Supply System and its consultants reevaluated the seismicity of the region, including the 1872 earthquake; compiled and analyzed all known published and unpublished geological and geophysical data, evaluated remote sensing imagery data, and developed a comprehensive plate tectonic model of the Pacific Northwest. These studies were followed up by field reconnaissance and geologic mapping in selected areas identified by the study. The regional studies added considerable additional information regarding plate tectonics and plate boundary characteristics of the Pacific Northwest. As a result of these investigations, Washington Public Power Supply System recognized the epicentral location of the 1872 earthquake as being somewhat within the broad area which includes Lake Chelan to the south and extends to the north as far as southern British Columbia (Ex. S-17, p. 2-2).

200. This information was reviewed by the Staff and discussed with the Advisory Committee on Reactor Safeguards. The Staff believes that the additional studies support the conclusion that the December 14, 1872 earthquake was centered in the region between Entiat, Washington, and Chilliwack, British Columbia, north of the Columbia Plateau structural province. The Advisory Committee on Reactor Safeguards is in substantial agreement with this opinion. The Committee and its consultants concluded in its report of November 15, 1977 that "...the 1872 Wenatchee earthquake should be considered an intensity VIII..." and that "...arbitrary

movement over extended distances of a prototype 1872 earthquake for purposes of seismic design should be reexamined." (Ex. S-17, p. 2-3).

201. It is the conclusion of the Staff that the earthquake should be considered to be a strong Intensity VIII (Modified Mercalli). The Staff specifically used "strong" to indicate that there exists doubt concerning the size of this earthquake, as indeed there exists similar doubt concerning many earthquakes of the last century. For many such earthquakes, there exist little more than fragmentary descriptions of their effects. For the 1872 earthquake, the only direct evidence for higher intensity of ground motion appears to be landslide phenomena. Since some landslides have occurred near the time of earthquakes of small magnitudes and other substantial landslides have occurred in no way related to any earthquake, it is the Staff's conclusion that landslide phenomena alone, in the absence of additional types of evidence, is not a sufficient basis to assign Intensity IX to the 1872 earthquake (Ex. S-17, p. 2-3).

202. The studies conducted by Washington Public Power System show that the Columbia Plateau on which the Pebble Springs site is located is distinguished from the region north of the Plateau within which the 1872 earthquake was centered on the basis of geologic and crustal structures and geophysical properties. These differences include:

(1) A high positive Bouguer gravity anomaly over the Plateau indicating anomalously thin crust over the area.

(2) The boundary of the Columbia Plateau is characterized by a relatively steep gravity gradient which would suggest high deviatoric stress. The zone of expected high deviatoric stress is in the area of historic epicenters near Chelan and near the southern end of the area within which the 1872 earthquake is believed to have been centered.

(3) The trends of major tectonic structures which lie immediately to the north and northwest of the Columbia Plateau structural province are different from those in the

Plateau. North and northwest of the Plateau, structural trends range between northwest and northeast, while in the west central part of the Columbia Plateau structural province, where structures are well developed, major structures trend generally east-west.

(4) There is a strong contrast in tectonic style between the Columbia Plateau structural province and the region to the north and northwest. The tectonic structures in the area north and northwest of the Plateau province are major faults and fault-bounded grabens. Displacements on the bounding faults are measured in kilometers. The structures in the Columbia Plateau structural province are mainly elongated folds with associated faults. Maximum displacements on the order of hundreds of meters have occurred on the faults. Thus, the style of deformation is markedly different within the Plateau.

(5) The rock types north of the Plateau are principally crystalline metomorphic and plutonic masses with sandstone and shales within downfaulted grabens. The upper rocks of the Plateau are basalt flows.

(6) Geophysical data indicate major differences in crustal properties beneath the Plateau.

Based on the above, the Staff concluded that the Columbia Plateau structural province should be considered a separate tectonic province within the meaning of 10 CFR Part 100, Appendix A. The December 14, 1872 earthquake was centered in an area generally north of the Columbia Plateau province. Therefore, a recurrence of this event should not be hypothesized near the Pebble Springs Nuclear Plant site (Ex. S-17, pp. 2-3 to 2-5). We agree with the Staff's conclusions.

203. As stated in the Staff's SER (Ex. S-13) and adopted as a finding above, there are no geological structures in the immediate site vicinity

that could cause surface faulting or localized earthquakes. Based only on this finding and the seismicity of the Columbia Plateau province, a site intensity of VII would appear to be the appropriate seismic design basis for the Pebble Springs site consistent with the requirements of 10 CFR Part 100. The Staff points out, however, that there exist compelling arguments, based largely on consideration of regional tectonics, which indicate that an additional margin of safety is required for the Pebble Springs site. The entire Northwest, from a location near Cape Mendocino in northern California northward to the vicinity of the international border, must be considered a region of active tectonics. That is, a subducting margin was active in this region until recent geologic time, and some measure of convergence may be ongoing along this boundary at present. There are, therefore, significant uncertainties in the Staff's understanding of the regional tectonic setting and the state of regional lithospheric stress. Because of these uncertainties, we concur with the Staff's conclusion that a conservative design for the Pebble Springs site requires that an Intensity VIII earthquake should be postulated and consequently a reference acceleration of 0.25g should be applied to the site (Ex. S-17, p. 2-5).

IV. CONCLUSIONS OF LAW

Based upon the available information and review to date, there is reasonable assurance that the proposed site is a suitable location for reactors of the general size and type proposed from the standpoint of radiological health and safety considerations under the Atomic Energy Act of 1954, as amended, and the rules and regulations promulgated by the Commission pursuant thereto.

V. ORDER

Based upon the Board's Findings and Conclusions, IT IS ORDERED THAT: This Partial Initial Decision (as it may be subsequently modified) shall constitute a portion of the Initial Decision to be issued upon completion of the remaining environmental and site suitability matters and the radiological health and safety phase of this proceeding.

IT IS FURTHER ORDERED THAT: In accordance with Sections 2.754, 2.755, 2.760, 2.762, 2.763 and 2.764 (a) of the Commission's Rules of Practice, 10 CFR Part 2, this Partial Initial Decision shall be effective immediately and shall constitute with respect to the matters covered therein the final action of the Commission forty-five (45) days after the date of issuance hereof, subject to any review pursuant to the Commission's Rules of Practice. Exceptions to this Partial Initial Decision may be filed by any party within ten (10) days after service of this Partial Initial Decision. A brief in support of the exceptions shall be filed within thirty (30) days thereafter (forty (40) days in the case of the Staff). Within thirty (30) days of the filing of the brief of the appellant (forty (40) days in the case of the Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

THE ATOMIC SAFETY AND LICENSING BOARD

_____

_____

_____

Dated at Bethesda, Maryland, this ____ day of _____, 1981.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PORTLAND GENERAL ELECTRIC COMPANY, et al.	)	Docket Nos. 50-514 50-515
	)	
(Pebble Springs Nuclear Plant, Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of Applicant's Proposed Findings of Fact and Conclusions of Law in the Form of a Partial Initial Decision as to Some Environmental and Site Suitability Matters have been served on the following by deposit in the United States mail, first class, this 22nd day of October 1980.

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